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Lucretius on Creation and Evolution

A Commentary on *De Rerum Natura* BOOK FIVE, LINES 772–1104

GORDON CAMPBELL

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In Memoriam
Don Fowler
Doctissimi Viri

Nothing to fear in God.
Nothing to feel in death.
But good can be attained,
And evil may be endured.

Philodemus, *The Fourfold Remedy*

Preface

I FIRST started this commentary as my D.Phil. thesis at Jesus College, Oxford, under the supervision of the late Don Fowler. His wonderful enthusiasm, vast learning, and breadth of vision gave me an insight into a world of scholarship I did not know existed. His confidence in me gave me the courage to believe I was capable of such a project, and enabled me to continue even during those times I had lost faith in myself. His extraordinary courage and cheerfulness in the face of death confirmed me in my view that Lucretius is a powerful force for good in the world. This commentary may be slight recompense for his confidence, but I dedicate it to him in deep gratitude.

I am also in the debt of many other kind and learned scholars, especially Dirk Obbink who generously acted as my supervisor during and after Don's final illness, Thomas Griffiths for his anthropological advice and many stimulating debates, and Stephen Simpson for his advice on Darwinian evolution. They should not be held responsible for any mistakes and omissions, which are of course my own. I am also very grateful to the late Don Fowler, and to Peta Fowler, for choosing me as Don's research assistant during his final illness, and giving me the opportunity to carry on working on Don's projects after his death. I would also like to thank all those who have given me valuable advice and criticism, especially my examiners Matthew Leigh and David Sedley, who also acted as my adviser for OUP and to whom I am grateful for many insights, and indebted for saving me from many mistakes.

G.C.

National University of Ireland
Maynooth 2003

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Abbreviations

Arr.	G. Arrighetti, *Epicuro Opere*, 2nd edn. (Turin, 1973).
Boas	G. Boas, *Primitivism and Related Ideas in the Middle Ages* (Baltimore, 1948).
CAG	H. Diels (ed.), *Commentaria in Aristotelem Graeca* (Berlin, 1882–1909).
DK	H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker* (Berlin, 1952).
E–K	I. Edelstein and I. G. Kidd (eds.), *Posidonius: The Fragments* (Cambridge, 1989).
Ep. Hdt.	Epicurus, *Letter to Herodotus.*
Ep. Men.	Epicurus, *Letter to Menoeceus.*
Ep. Pyth.	Epicurus, *Letter to Pythocles.*
Ernout–Meillet	A. Ernout and A. Meillet, *Dictionnaire étymologique de la langue latine* (Paris, 1959).
FHS&G	W. W. Fortenbaugh, P. M. Huby, R. W. Sharples, and D. Gutas (eds.), *Theophrastus of Eresus* (Leiden, 1992).
Grimal	P. Grimal, *Dictionary of Classical Mythology* (Oxford, 1986).
KΔ	Epicurus, *Principal Sayings*
KRS	G. S. Kirk, J. E. Raven, and M. Schofield, *The Presocratic Philosophers* (Cambridge, 1983).
LA	F. Longo Auricchio, *Ermarco: Frammenti* (Naples, 1988).
L&B	A. O. Lovejoy and G. Boas, *Primitivism and Related Ideas in Antiquity* (Baltimore, 1935).
L&S	A. A. Long and D. N. Sedley, *The Hellenistic Philosophers* (Cambridge, 1987).
LSJ	H. G. Liddell, R. Scott, and H. S. Jones, *A Greek–English* Lexicon, 9th edn. with suppl. (Oxford, 1996).
Maltby	R. Maltby, *A Lexicon of Ancient Latin Etymologies* (Leeds, 1991).
M&P	A. Martin and O. Primavesi (eds.), *L'Empédocle de Strasbourg (P. Strasb. gr. Inv. 1665–1666)* (Berlin and Strasbourg, 1998).

OCD	*Oxford Classical Dictionary*, 3rd edn., ed. S. Hornblower and A. Spawforth (Oxford, 1996).
OLD	*Oxford Latin Dictionary*, ed. P. G. W. Glare (Oxford, 1982).
Pauly	A. Pauly and G. Wissowa, *Paulys Real-Encyclopädie der classischen Altertumswissenschaft* (Stuttgart, 1894–).
PCG	R. Kassell and C. Austin (eds.), *Poetae Comici Graeci* (Berlin, 1983–).
SVF	H. von Arnim, *Stoicorum veterum fragmenta* (Leipzig, 1903–24).
TLL	*Thesaurus Linguae Latinae* (Leipzig, 1900–).
TrGF	B. Snell (ed. R. Kannicht), *Tragicorum Graecorum Fragmenta* (Göttingen, 1986).
Us.	H. Usener, *Epicurea* (Leipzig, 1887).
Us. *Gloss.*	H. Usener (ed. M. Gigante and W. Schmid), *Glossarium Epicureum* (Rome, 1977).
Wehrli	F. Wehrli, *Die Schule des Aristoteles* (Basel and Stuttgart, 1969).

INTRODUCTION

The Creation and the Origin of Species

From the time of Empedocles, at least, down to the present day a great battle has been waged between teleologists and anti-teleologists over the creation of the world; between those who, like Lucretius, dismiss God from his role as Creator and designer of the world and of life, and those who see the world, and all the creatures in it, as a product of intelligence and design.

In the ancient world the main protagonists were, on one side, the atomistic anti-teleological mechanist Democritus, and later his fellow Atomist Epicurus, and on the other side, the teleologist Plato, especially in *Timaeus*, and later Aristotle who modified Plato's teleology, and later again the Stoics who modified Plato's system in their own way.[1] These represent two fundamentally different and opposed world-views. Thus, Lucretius' position in the ancient struggle should be clear: he follows Epicurus, and so represents the anti-teleological position. However, the relationship between Lucretius and his sources and his enemies is complex: Lucretius, in his zoogony especially, although we must assume he follows Epicurus' own theory, probably from *Περὶ Φύσεως* books 11–12,[2] borrows heavily from Empedocles. The position is further complicated by Plato's appropriation and inversion of Empedoclean and Democritean science in *Timaeus*. Plato produces a subversive text that undermines what I see as a certain Presocratic orthodoxy in cosmogony that includes Democritus and Empedocles, and perhaps other Presocratic Physicists such as Archelaus, who similarly view cosmogony, zoogony, and anthropogony as part of the same process.[3] In *Timaeus* Plato reclaims scientific cosmogony for the teleological world-view, and gives a gloss of scientific respectability to mythological accounts of the origins of life.[4] Lucretius represents a late statement of this fifth-century anti-teleological cosmogonic orthodoxy, in direct line of inheritance from Democritus and Empedocles, through Epicurus; but inevitably both Epicurus and Lucretius are faced with the need to argue against *Timaeus*, and so to reappropriate scientific cosmogony for the anti-teleological world-view. The direction of intertextual reference between *Timaeus*, Democritus, Empedocles, and Epicurus, then, is not simple. Lucretius follows Epicurus, who in turn follows Democritus, and so, *Timaeus*, in arguing against Democritus, will argue also against the ideas put forward by Lucretius, and so the direction of intertextual reference is reversed. Put another way, Lucretius, as presumably Epicurus had already done, needs to rescue Democritean and Empedoclean zoogony, and reappropriate it for the anti-teleological mechanistic tradition, thus implicitly arguing against *Timaeus*. Further, post-*Timaeus*, Lucretius must now argue against an evolutionary theory of the origin of species given a gloss of Empedoclean respectability, in a way that neither Democritus nor Empedocles, pre-*Timaeus*, had to. So Lucretius must become an anti-Evolutionist, where Democritus and Empedocles were simply non-Evolutionists, since, as I argue, the only fully evolutionary theory of the origin of species in ancient science, at least, is found in Plato's *Timaeus*.

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[1] See Furley, 1989, 223 ff.

[2] Sedley, 1998, 121–2.

[3] Cf. Anaxagoras DK59 B4; Archelaus DK60 A4 and A1; and see Havelock, 1957, 104 ff.

[4] See Campbell, 2000.

Lucretius' presentation of his zoogony is strongly intertextual with Empedocles,[5] and I contend that this is not simply a reflection of his poetic debt to Empedocles, as critics such as D. N. Sedley argue,[6] but also reflects a more fundamental philosophical influence, and that Lucretius chooses Empedocles as his model as the chief example of an anti-teleological system of the random creation and adaptation of life available to him. It has been argued that Empedocles is not an anti-teleologist,[7] but while Lucretius is certainly not averse to appropriating the language and ideas of his opponents, twisting and recontextualizing them, here where the crucial point to establish is that the creation of life was random and undirected, it seems far more likely that Lucretius enlists the aid of Empedocles as though he were a fellow anti-teleologist, and thereby gains both Empedoclean glamour and ancient anti-teleological authority for the Epicurean theory. (In my review of Sedley (Campbell, 1999), I argued that Empedocles' use of a teleological explanation for the creation of the eye (DK31 B84 and 86), upon which Sedley relies, need only be seen as a didactic device, but I now accept Sedley's argument that Empedocles may well have seen the creation of limbs and organs as purposive, while allowing no teleology in the formation of species. Cf. DK31 B96 on the creation of bones with Simplicius' comments.)

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[5] See esp. Furley, 1970.

[6] See Sedley, 1998, 16 ff.

[7] Sedley, 1998, 19–21; but see Sorabji, 1980, 180–1; review of Sedley, 1998 in Campbell, 1999. I use 'teleology' in a broad sense to include poetic and mythological theories of divine design and creation.

We may assume that Lucretius had available to him Epicurus' lost treatment of the creation in *Περὶ Φύσεως* 11–12,[8] and while we do not know whether Epicurus borrowed directly from Empedocles, or to what degree Empedocles is one of Epicurus' sources, it seems likely from Epicurus' famous antipathy towards poetry and mythology that he did not follow Empedocles directly, and that Lucretius has imported extra Empedoclean material into the Epicurean account. The Empedoclean and Epicurean systems of the adaptation of life were certainly considered by at least one ancient commentator to be fundamentally similar.[9] Of course, it may be argued that, as Lucretius' zoogony is intertextual with many of the standard Presocratic texts on the origins of life,[10] Empedocles will be present here in any case, and as Lucretius' chief poetic model for his cosmological poem, he will inform the zoogony without any conscious allusion to him on Lucretius' part. However, there are enough Empedoclean echoes, especially in the section 837 ff. on the origin of species, to suggest strongly that Lucretius consciously chooses to present an 'Empedoclean' version of zoogony.

The other Presocratic theories of zoogony are not preserved even in such detail as Empedocles', but there seems to be a common scientific tradition of the original spontaneous generation of life from the earth (see Appendix A). Even fewer details of Presocratic theories of the origin of species are preserved, but we may reasonably assume that Democritus, at least, had a scheme similar to that of Epicurus, and Simplicius argues (from what evidence is unknown)[11] that all the Presocratics and Atomists, including the Epicureans, had a similar theory: that all possible creatures arose randomly from the earth in the beginning, and that their number and variety was reduced by the extinction of less well adapted forms, thus producing species that are well adapted to their environment by a non-teleological mechanistic process.

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[8] Sedley, 1998, 121–3; Obbink, 1996, 306.

[9] Simpl. *in Phys. CAG* 9.371.33–372.11. For Epicurus' antipathy to poetry: Diog. Laert. 10.121b (= fr. 1.121b2 and 4 Arr.), frs. 43 and 89 Arr. See Clay, 1995, 3–14, and Obbink, 1995, 189–209. Epicurus, according to Philodemus (*De Piet.* 519–41, 2145–74, 2480–2509 Obbink), did not condemn all poetry but only that which retailed false stories about the gods, and thus promulgated religion. See Obbink, 1995, 193 ff.

[10] Blundell, 1986, 48. See Appendix A.

This ancient battle in cosmology is still raging, and although over the last 140 years since Darwin's *Origin of Species* the Evolutionists have gained a lot of ground, and even established a certain orthodoxy, Creationist ideas have recently undergone a great resurgence. The popularity of Creationist explanations of various kinds has increased extraordinarily in recent years, as may be seen from Seth Kroger's 'Creationist Web Links'.[12] The Darwinian side of the argument will be found most conveniently at the 'Talk Origins Archive'.[13] In this battle, again, there should be a fundamental bifurcation between Creationist and Evolutionist views, but again, there has been significant appropriation and subversion of one position by the other, especially in the development of Creationists' responses to the ever increasing scientific pressure from Darwinism. At the more intelligent end of the Creationist spectrum, we find Scientific Creationism, which, much as Plato does in *Timaeus*, seeks to appropriate the scientific basis of its opponents' position. Further, Darwin himself appropriated the very idea for which he is most famous, the adaptation of life by extinctions, from the Creationists.[14]

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[11] Simpl. *in Phys. CAG* 9.371.33–372.11. It is quite possible that Simplicius simply rehearses the Aristotelian line of complaining that the Presocratics concentrated excessively on the material cause and neglected the final cause, and thereby assumes that all their theories of the origin of species were essentially similar.

[12] Online at http://www.slonet.org/~skroger/evolution/c-pages.html.

[13] Online at http://www.talkorigins.org/ (both accessed August 2001).

[14] See below on 837ff.; Bowler in Fox Keller and Lloyd, 1992, 107; and Campbell, 2000.

Lucretius' place in the battle between Darwinism and Creationism is not straightforward, but *De Rerum Natura* (*DRN*), and especially book five, was seen as one of the main champions of an anti-teleological mechanistic account of creation, and as such was a target for Creationist attacks, until the publication of Darwin's *Origin of Species* in 1859, which then tended to draw most Creationist fire. Famously, the eighteenth century produced two great anti-Lucretian didactic poems: Cardinal Polignac's *Anti-Lucretius* of 1747, and Sir Richard Blackmore's *Creation* of 1712. Blackmore expends seven books of verse to argue against Lucretius' account of the universe, especially the creation of the world and of life, and, perhaps partly because his vision is not clouded by later Darwinian assumptions about Lucretius' system, often shows an understanding of Lucretius' account of creation that shames modern commentators. Because of its anti-Creationist stance, *DRN* was always considered a subversive text, and we are very lucky that one manuscript survived until the Renaissance, from which all other manuscripts derive.[15] Lucretius was not taught to undergraduates at Oxford University until the mid-nineteenth century, and even then there was strong opposition on religious grounds to his introduction, notably from John Ruskin. No full translation of *DRN* was published until that of Thomas Creech in 1682, and then there were fears about the corrupting effect it would have on the morals of the nation's youth (see Creech's defensive foreword). The great Puritan Lucy Hutchinson's earlier translation was not published until 1996.[16] Of John Evelyn's 1656 translation, only book one was published.[17] As Matthew Prior humorously complained in 1718 in *Alma; or The Progress of the Mind* 1.135 ff.:[18]

> Note here, Lucretius dares to teach
> (As all our youth may learn from Creech)
> That eyes were made, but cou'd not view;
> Nor Hands Embrace, nor Feet pursue:
> But heedless Nature, did Produce
> The Members first and then the Use.

---

[15] Reeve, 1980; Fowler, 1993.

[16] See de Quehen, 1996.

[17] See Gordon, 1962, 170 ff.

[18] Available online at http://lion.chadwyck.co.uk:8080/.

What Each must act, was yet unknown,
'Till All is mov'd by Chance alone.

Lucretius was seen as an ally of Darwin as soon as *Origin of Species* was published, and although *DRN*'s importance as an anti-Creationist text then faded somewhat, eclipsed by Darwin, it was still seen as a precursor of Darwinism.[19] This has remained the position ever since, and many textbooks on evolution that include a history of the development of evolutionary theories describe Lucretius, along with Empedocles, as an ancient Evolutionist, or make general references to 'Greek thinkers' as Daniel Dennett does.[20] In a similar way, partly because of his former perceived role as an anti-Creationist, and partly because he is used as ancient authority by the Darwinists, Lucretius was subject to Creationist attacks in the late nineteenth century, and indeed still is even today.[21]

I do not consider Lucretius to be an Evolutionist, in the sense of being a direct forerunner of Darwin. They both put forward anti-teleological and mechanistic views of the origins of species, but their mechanisms are fundamentally different. Essentially it is the fact that both Lucretius and Darwin use extinctions in their schemes of adaptation that has led to the comparison between them.

In modern thinking, Creationists and Evolutionists have used extinctions in quite a different way from ancient theorists, and this has led to confusion. However, where in ancient thinking extinction was the argument of the anti-teleologist, in modern thinking before Darwin, it was an argument of Creationists.[22] That is, they posited an initial divine creation of fixed species that have since been whittled down and thus adapted by extinctions, especially, but not exclusively, the mass extinctions of the Mosaic Deluge.[23] Baron Cuvier (1806) was the first to prove scientifically that species extinctions have occurred in the past, a fact he used to argue against the theories of one of the earliest Evolutionists, the Chevalier Lamarck (1809), arguing that if creatures were able to adapt themselves by evolving in the face of environmental change, we would not see species extinctions in the fossil record. Lamarck proposed a theory of evolution, but without extinctions, that relied on mutation caused by the inheritance of acquired characters. Famously, in Lamarck's theory, the giraffe has evolved its long neck by parent giraffes stretching up to eat high leaves, thus lengthening their necks slightly. They then pass on this acquired extra neck length to their offspring, who are born with slightly longer necks than their parents had been. They then repeat the process, and so on from generation to generation until we get the very long-necked giraffes of today.[24] The inheritance of acquired characters, although commonly accepted in the ancient world and still popular until this century because of political unease about the ethical consequences of Darwin's 'survival of the fittest' doctrine, especially in Soviet biology under Lysenko, is no longer thought to be possible, at least in this simple direct way.[25] It was this system that Charles Darwin and others took and worked upon to produce a more plausible method of adaptation. Darwin's solution was to occupy some of his opponents' ground and to use extinctions as his main mechanism of adaptation. Darwin did not entirely reject the theory of inheritance of acquired characters,[26] but it was not an essential aspect of his fundamental scheme. Put briefly, his theory of natural selection assumes the inevitable mutation of progeny from their parents because of genetic differences between the two parents, which are passed on to their progeny, who will inevitably tend to differ from their parents even more greatly. Thus, we have the fact of evolution. He accounts for adaptation by the extinction of those progeny less well adapted to their environment, and through competition between them and other species in the 'struggle for life'.[27] It is this appropriation by Darwin of extinctions as a method of adaptation that leads us to assume that any ancient scheme that involves extinctions must be an evolutionary one.

---

[19] For the reception of Lucretius in the 18th and 19th cents., see Hadzsits, 1963, 317–32, and Johnson, 2000, 103 ff.

[20] *Darwin's Dangerous Idea*, 1995, 17 ff.; see also the 'Internet Encyclopaedia of Philosophy' s.v. 'Evolution', online at: http://www.utm.edu/research/iep/e/evolutio.htm.

[21] See Townsend, 1889, part 6, online at 'The Revolution Against Evolution' http://www.rae.org/ with the comments of D. Sharp in *Origins & Design* 18:1 online at http://www.arn.org/docs/odesign/od181/editor181.htm. See also Karen Bartelt on Lucretius' place in the anti-Evolutionist exhibition at the Institute for Creation Research, 'A Visit to the Institute for Creation Research' online at http://www.utm.edu/research/iep/e/evolutio.htm (all accessed August 2001).

[22] Bowler in Fox Keller and Lloyd, 1992, 10.

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[23] See Buckland's *Reliquiae Diluvianae*.

[24] *Philosophie zoologique* 1.256–7, see Burkhardt, 1995, and U. California Museum of Paleontology, Berkeley, online at http://www.ucmp.berkeley.edu/history/lamarck.html (accessed August 2001). For the relationship between Cuvier and Lamarck see Daudin, 1926–7.

[25] See Appendix A; Balme on Arist. *Gen. An.* 721^{b}7 ff.; Bowler in Fox Keller and Lloyd, 1992, 188 ff.; and see below on 1011 ff.

[26] *Origin of Species*, ch. 5, 'Laws of Variation: Effects of Use and Disuse'.

In ancient *scientific* thinking the evolutionary origin of species by the inheritance of acquired characters is found only in Plato's *Timaeus*,[28] and while the inheritance of acquired characters is accepted by many other ancient thinkers, it was not thought to be able to cause mutation across species boundaries. It is, however, the fundamental mechanism of many mythological aetiologies for species origins, as may be seen from Ovid's *Metamorphoses*, where frequently a new species arises by the metamorphosis of a human being caused by their behaviour: for example, Lycaon behaves like a wolf, and so becomes one, retaining his shaggy grey hair and yellow eyes.[29] Lucretius uses evolutionary mutation caused by the inheritance of acquired characters to explain the evolution of fully modern humans from a more bestial form (5.1011–27), but does not regard this as a crossing of a species boundary since the earlier form was also human (5.925 ff.).

So in modern terminology, we may class Lucretius both as an anti-Evolutionist, since he insists on the fixity of species, and as an Evolutionist, since he does account for the clear differentiation of the human race from animals by an evolutionary process. Neither of his mechanisms of adaptation, however, is Darwinian, and must be viewed without a Darwinian filter to be clearly understood. Our ideas of species origins are so heavily influenced both consciously and unconsciously by Darwinism, however, that this is difficult to achieve. Recognizing this, I investigate the background to Darwin's theory in order that we may be able to gain a clearer view of ancient theories.

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[27] See Wilkins, 1997*b*, 'Darwin's Precursors and Influences: 7. Heredity', online at http://www.talkorigins.org/faqs/precursors/precur10.html (accessed August 2001).

[28] Pl. *Tim.* 42a ff., 91d ff.

[29] *Met.* 1.163 ff.; see Myers, 1994, 27–60.

The Function of Prehistory

Modern human society will be the main ethical focus of any prehistory. The zoogony, although crucial in its own right for rebutting any idea of a divine creation, also serves the function of establishing the scene for the origins of human society: just as life itself, and all species, are the product of the interaction of chance and necessity, so is modern society, and the two are seen as part of a continuum of development. The aetiological function of prehistories is well understood in the study of myth, and few prehistories may be said to be 'straight', or to lack an aetiological purpose. Prehistories provide an aetiology for the way things are, or seem to be, today, and show how they may be better in the future. Modern human society is the starting point, and prehistory is a mirror we hold up to view ourselves.[30] In this way, a prehistory speaks of past, present, and future; the link between them being the idea of a continuation of process or pattern that underlies events.[31] So, rather than being a disinterested scientific account of the distant past, any prehistory will be partial, and will focus on those ethical aspects the writer wishes to highlight. Lucretius' prehistory is no different in this respect.

Further, both mythological and rational prehistories are written to privilege an aspect, or aspects, that the writer wishes to exhibit as crucial both in the development of society, and in its continued existence. This may be seen clearly from Lovejoy and Boas' serendipitously eccentric collection under the heading 'Later Anti-Primitivism';[32] here we find a great variety of texts, privileging various spurs to the development of society: Vitruvius, understandably, (*De Arch.* 2.1) fire and houses, Ovid (*Ars Am.* 2.467 ff.) love, Manilius (*Astron.* 1.66 ff.) astronomy, and so on. None of these writers is a disinterested anthropologist. In book one of Manilius' *Astronomica*, for example, a dominant analogy is between Augustus as the controlling principle on earth, and the *anima mundi* as the controlling principle of the universe (cf. 1.7 ff., 1.799–80, 1.925–6). Study of the heavens allows us to recognize and accept this, and so the world remains at peace. Thus, astronomy was the chief spur to the development of civilization and the arts of peace originally.

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[30] Cf. Blundell, 1986, 135–6.

[31] Cf. Lévi-Strauss, 1977, 209–10.

[32] L&B 368 ff.

Accordingly, Lucretius' prehistory is part of a tradition in which we learn more of the writer's political and ethical concerns with the present than of his ideas about the past. As I argue in the commentary, Lucretius' crucial task in his prehistory is to establish that all life, animal and human, all species and their attributes, and all human culture and society are the products of the interaction of chance and necessity over time, and that they owe nothing to God. One particular concern is to show that language, a paradigm of culture for the Epicureans, owes nothing in its origins to any first name-giver whether human or divine, but within this essential scheme, other ethical concerns lead him to take the opportunity to highlight and expound Epicurean ethical theories, retrojecting them into the past. We thus have something of a double function of each topic of the prehistory: first, each is a part of the continuum of the development of culture, essential in explaining modern society, and second, each is highlighted and elaborated in Epicurean terms. For example, the picture of humans browsing on acorns, and the beautiful ecphrasis of the stream rushing down from the mountains at 945 ff., serve not only the purpose of establishing that early human survival is quite straightforwardly explainable without appealing to culture as a divine gift—wild foods and water have always been plentiful—but also serve to give Lucretius the opportunity to highlight the priority, chronological and therefore ethical, of Epicurean dietary ethics.

Lucretius, Primitivist or Progressivist?

As I learned in writing this commentary, Lucretius appropriates from a wide range of sources, many of them lost to us, many still extant, and his prehistory is constructed out of readily available building blocks, as I have attempted to display in the tables of themes. This gives him a great opportunity, but also narrows the range within which he can discuss prehistory. On the one hand, there are very many topoi available to him, ready to be turned to his own devices, but on the other he has to operate in a field already laid out for him. In the introduction to 925ff. I characterize these topoi as 'memes',[33] or 'viruses of the mind', that behave as if they have an independent existence of their own, and carry with them some of the accretions of meaning they gained from their former contexts. These memes may also be deliberately appropriated, 'turned', and used in a way quite different from their original uses.[34] This appropriation of positive themes from mythological prehistories accounts for a great deal of the positive feel of the prehistory: what I describe as a Golden Age feel, as a convenient shorthand for the sort of colouring given to blessed ages both past and future, and blessed lands.[35] That is, the honeyed cup/sugared pill technique, in this case getting the reader to swallow the bitter pill that human society, culture, and justice are not gifts of the gods, works best with a good admixture of honey, and this is supplied by readily available Golden Age topoi, which originally argued just the opposite.[36] Therefore, we need worry less about whether Lucretius 'approves' of this first stage of human life, or whether he is a Primitivist or a Progressivist.[37] His prehistory is not configured according to his approval or disapproval, but according to his didactic purposes, and both positive and negative constructions of the past, both traditional, are of use to him in this. His technique of borrowing the language and topoi of his opponents to better convey his message, may well invest the prehistory with various shadings, from the darkest to the lightest, and from the most optimistic to the most pessimistic, but he attaches no absolute values to prehistory.

Accordingly, in the commentary I attempt to avoid Lovejoy and Boas' terms 'progressivism' and 'primitivism' (I do allow myself 'cultural primitivism') since I do not really know what they mean; they do not accurately describe any ancient anthropologist, and they more often obfuscate than illuminate ancient theories.[38]

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[33] Following Dawkins, 1986 and 1993; Dennett, 1995, 335 ff.

[34] See further, introduction to 925–1010 'The memes of prehistory'.

[35] This may sometimes be quite anachronistic, since Greek writers always refer to a 'Golden Race', and 'Golden Age' seems to be an invention of Roman writers of the second half of the 1st cent. BCE. Horace, in *Epode* 16.64–5, seems to be the first writer to speak of a *tempus aureum*. See Blundell, 1986, 136, 156–7, and Baldry, 1952, 83 ff.

[36] See further below, introduction to 925–1010 'The memes of prehistory'.

[37] The question that has dominated the debate, cf. esp. L&B; Kenney, 1972; Furley, 1978; Merlan, 1950; Boyancé, 1963, 236 ff.

Lucretius' prehistory, although it may seem radical and original among so many teleological accounts in the ancient world due to its anti-teleological stance, is in fact the culmination of a tradition of rationalist prehistory, much of it lost, that begins with the Presocratics, especially Democritus, is interrupted by Plato, and developed by Epicurus.[39] It is not clear that Lucretius' prehistory, in its fundamental ideas, differs radically from Epicurus' theories as laid out in the lost book 12 of *Περὶ Φύσεως*,[40] but it is clear that what is different in Lucretius' treatment is this remarkable recycling of themes from mythological, teleological, and poetic sources, often in their original context entirely opposed to his rational anti-teleological scheme.[41]

A study of the themes of his prehistory shows that he ignores few of the topoi that are commonly found in prehistories, descriptions of the Golden Age, of earthly paradises, of ideal states, or of 'primitive' peoples at the margins of the known world. I have collected many of these in a table (Appendix B). This has the advantage of allowing an overview of the structure of ancient anthropological speculations, and also clears many repetitious references from the commentary itself, allowing the commentary to remain more uncluttered and readable.

Lucretius and the Golden Age

Lucretius' relationship with a Golden Age is made complex by the great number of points of contact between his prehistory, in its essence a rational account, and irrational mythological Golden Age accounts. Clearly, the world described in Lucretius' prehistory is, in its outlines, not any sort of a Golden Age, but the resemblance between the two is striking. An idealized scheme of a traditional Golden Age and its ethical tone may be attempted as follows:[42]

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[38] The problem of attributing such notions as primitivism and progressivism anachronistically to ancient writers is well discussed by Havelock, 1957, 410–12; Cole, 1990; Blundell, 1986, 103 ff.; Dodds, 1973, 1–25; and Edelstein, 1967.

[39] For Democritus' influence on prehistory see Cole, 1990. Note, however, that Cole exaggerates Democritus' role as the founder of rationalist prehistory. For Plato's disruption of rational anthropology see Havelock, 1957, 11 ff.

[40] Sedley, 1998, 121–2, 152–4, but see below on 1028 ff.

[41] For Epicurus' attitude to poetry and mythology, see Phld. *De Piet.* 225–31, and 2480–2509 Obbink; Phld. *De Poem.* 5 cols. 1–6 Mangoni; Diog. Laert. 10.121b (= fr. 1.121b2 and 4 Arr.); Epicurus frs. 42, 89 Arr., see Clay, 1995, 3 ff., and Obbink, 1995, 189 ff.

First, the lack of agriculture dominates (5.933–6). This forms one of the central defining features of the Hesiodic style of Golden Age, in which agriculture is unnecessary due to the milder climate and greater fertility of the earth. This ensures a life of ease for the inhabitants of the Golden Age: they need not toil for their subsistence and so work is unknown.

Closely related to this is the absence of property (5.1113): since all things are provided free by the earth, property is unnecessary. Again, the theme of the lack of land-boundaries goes closely with this (5.1110), and this implies that there is no stimulus for the acquisition of land, and thus no stimulus for conflict and warfare, another of the central themes of the Golden Age (5.999–1000). Without the need for agriculture there is no need for settled permanent homes (5.1011), and so no need for villages, towns, or (especially) cities with all the strife and discord that they traditionally engender (5.1120 ff.). Without the stimulus of greed, justice arises naturally, and so laws are unnecessary. The lack of warfare links back to the lack of cities, which are often presented as closely linked to warfare, either as made necessary for protection because of warfare (cf. 5.1108–9), or as incitements to warfare.

The bounty of the earth ensures that all needs are met locally, and so there is no need to travel to find food, and seafaring especially is unnecessary (5.1001–6), arising as it traditionally does from a dissatisfaction with one's own native land and produce, and thus from a search for wealth and luxuries (5.1442?). Seafaring itself is closely linked to warfare: without the stimulus of greed there is no motive for international aggression by sea. Similarly, without property there can be no greed for more and thus no seafaring or warfare.

The invention of property is often linked with the discovery of metals and metallurgy: gold, especially, becomes property and wealth when it is discovered, and causes a moral degradation that is an incitement to greed and thus to conflict, seafaring, and warfare (5.1113 ff., 1281 ff.).

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[42] Compare Blundell's analysis, 1986, 136–7, and for the different types of Golden Age see Johnston, 1980.

Metals of course, as well as initiating property, moral degradation, greed, and warfare, also initiate technology, crafts, and labour, and are frequently linked with the origins of agriculture (5.1286–96). The fertility of the earth, which makes agriculture unnecessary (5.941–4), is sometimes attributed to the earth's response to the moral excellence of the people of the Golden Age: as they suffer moral decline, so the earth suffers a decline in fertility which makes agriculture necessary (2.1164ff. against this notion).

And so, the origins of agriculture link back to the beginnings of warfare, and warfare, seafaring, property, wealth, moral degradation, greed, land-boundaries, metallurgy, technology, cities, moral decline, loss of justice, and the decline of the earth's fertility become intertwined in a nexus of cause and effect.

The linkages made above present an idealized scheme of the Golden Age, and while many of them appear together in many accounts (see Appendix B), no single extant account presents them all together, and the account that most closely matches this scheme of the Golden Age is Lucretius'. Clearly, Lucretius has absorbed nearly the entire Golden Age within his prehistory. As I say above, this derives partly from necessity in discussing a subject etched so firmly into his own and his readers' minds in the form of memes, and partly from his honeyed cup/sugared pill technique, but this is not the end of the story. Epicurean ethics are dominated by a certain 'cultural primitivism', and this leads them to a deeply ambiguous view of civilization itself. First, the Epicurean view of the development of civilization, and especially justice, is distinctive: there are three stages, the middle one of which, the first villages, is the nearest to an Epicurean ideal state. Thus, there is not a neat upwards or downwards progression, but, in terms of justice at least, both a rise and a fall over time (see introduction to 1028ff.). Civilization is a stop-gap measure, which is necessary because of present-day human injustice. This injustice is caused by the fear of death and by religion, but civilization can only ever achieve an approximation to justice through restrictive legislation. There was a naturally occurring just state in the past, and this may be regained, not through the further development of the contrivances of civilization, but through the embracing of Epicureanism.[43] With the fear of death banished, justice may again arise according to the informally contractarian Epicurean theory. Thus, the second stage (1011–27) retrojects Epicurean justice into prehistory, providing an aetiology and a legitimization for the Epicurean theory of justice: Epicurean justice is chronologically, and thus logically, prior to coercive legislation.

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[43] Cf. Diogenes of Oinoanda fr. 56 Smith.

It also serves an allied purpose: to allow the viewing of human society and of justice in its natural state, without the obscuring accretions of culture, very much as in the familiar topos of the appeal to Noble Savages. This technique is not available directly to Lucretius for the first stage (925–1010), since this is not by any means an ideal state, but he does use a very similar technique here. He exploits the familiar positive topoi of the Golden Age to exhibit Epicurean ethics in a natural state. We cannot of course view the people of this first stage as Epicureans (compare Seneca's arguments in *Ep.* 90 against Posidonius' view of prehistoric people as philosophers),[44] but they do exhibit some praiseworthy characteristics. These help to contrast and criticize modern *mores*, and to privilege Epicurean ethics. Again, this has inevitably led to confusion: does Lucretius view the first wild stage as an ideal state? Certainly he does not (there is no justice or co-operation for one thing), but the opportunity to use the first humans as noble savages is too good to miss: as Seneca says in *Ep.* 90, if the first people behaved well it was because they had no modern temptations to prevent them. Lucretius' picture is much more complicated than Seneca's, but although they argue from diametrically opposed positions, their techniques are very similar.

The Origins of Language

For a detailed examination of the Epicurean theory of the origin of language and its context, see the introduction to the commentary on 1028–90. Here I shall place the theory in the didactic context of the prehistory.

A reconstruction of the Epicurean view of the place of language in the development of the first societies, piety, and justice, and of civilization, impiety, and injustice, may be attempted along the following lines. In the first stage, during the

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[44] Fr. 284 E–K.

erramento ferino, the first humans were able to perceive the *simulacra* of the gods as well as later people were since the gods are eternal and the perception of their *simulacra* does not involve the application of reason.[45] Reason is lacking in the first stage of prehistory when people learned directly from nature.[46] But, without the application of reason to the images of the gods, the first humans would be unable to form false opinions about them and so would have a true picture of divinity, and a naturally arising form of true piety.[47] False opinions arose only later when people began to wonder at the order of the heavens and attributed great cosmic powers to the gods, through mistakenly reasoning that the order of the heavens must be controlled by beings who they could see were clearly super-human, and so they assumed wrongly that the world is controlled by the gods (5.1183 ff.). The first humans, then, had no false opinions concerning the heavens and so no superstitious beliefs (see on 5.973 ff. below).

The connection between the origins of language, religion, and injustice is based on this ability to form false judgements. Originally words, produced by direct interaction with nature, would hold only their true fundamental meanings, and thus 'God' would mean nothing more than what the *simulacra* of the gods, as perceived by early people, showed the gods to be: perfectly happy eternal beings. Further, the gods would, in prehistory, have their real, naturally occurring, names.[48] The later application of false reason to words would inevitably result in an accretion of false meanings attaching to the word 'God', and lead to the formation of false religion.[49] This closely relates to the Epicurean theory that there is a fundamental true meaning or primary notion that underlies each word and provides a πρόληψις or preconception of the thing itself. The philosopher must be aware of these true meanings of words and ensure that she keeps in mind the true fundamental sense of each word, stripped of accretions of false opinion.[50] This theory of the meaning of words derives from the Epicurean approach to the investigation of nature, which is based on the theory that all sense perceptions are true.[51] Thus, things themselves, by their physical interaction with the sense organs and the mind, provide a word, which gives a true notion of the real nature of the thing. Originally 'God' would convey only its true meaning, but after the beginning of religious error when control of the world had been generally attributed to the gods, 'God' would carry with it this religious connotation of cosmic control as an accretion of false meaning, very much as a computer virus attaches to a software program, and gradually corrupts the carrier. Thus, religion arises only when reason begins to be applied to nature, and only when language develops, because language is the carrier of the *religio* virus and allows the rapid spread of *religio* by the dissemination of false ideas. This is the argument behind 5.1133–5 where Lucretius claims that politicians behave as they do because they accept the opinions of others rather than applying reason to nature: they are infected by false opinion. Philodemus reports that Epicurus considered poetic performances, along with sacrifices and religious processions, to have been heavily implicated in the original spread of religious error. He argues further that unscrupulous early philosophers and theologians knew that the traditional religious ideas about the gods were false, and that the gods caused harm to no one, but seeing that others feared the gods, promulgated myths in order to control the foolish, and as Philodemus says, prevent human life becoming once more θηριώδης.[52] Lucretius exhibits language evolving during the formation of the first societies, and as crucial to the ability of the first villagers to persuade each other of the value of friendship pacts, which allowed the first societies to exist (1021–3). Thus, language is closely tied in to the development of society as a positive cohesive force, but also, in its association with the rise of religious error, it is a negative force involved in the descent into strife and violence that occurs during the rise of civilization.[53]

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[45] *DRN* 5.1169 ff.; Phld. *De Piet.* 225–31 Obbink; Sext. Emp. *Adv. Math.* 9.25 = fr. 356 Us. See Obbink, 1996, 306–7.

[46] *Ep. Hdt.* 75.

[47] Phld. *De Piet.* 230 ff. with Obbink 309 ff.

[48] Phld. *De Piet.* 519 ff.; Obbink, 1995, 197 ff., and 1996, ad loc.

[49] Phld. *De Piet.* 265–70.

[50] See *Ep. Hdt.* 37–8 with L&S i. 101 and 88–90, and Everson, 1994, 79 ff.;

Epicurus *On Nature* 28 frs. 6, 8, 11, 12, 13 ed. Sedley, 1973; and Konstan, 1973, 48–9.

[51] L&S i. 83–6 and 88–90.

[52] *De Piet.* 1176–1217, and 519–41. See Obbink, 1995, 196 ff.; Gigante, 1957, 97–8. Compare *DRN* 5.1188, and Critias *Sisyphus TrGF* 1.43 fr.19.

[53] 5.1120 ff.; see Konstan, 1973, 51–8.

This process can be seen at 3.59 ff. where Lucretius attributes the evils of society to the fear of death (civil war, amassing wealth, greed, envy, fratricide, etc.). Putting this together with the remarkably similar description of the problems accompanying the rise of civilization at 5.1120 ff., it can be seen that the anti-social behaviour described in 3.59 ff. is caused by a vain attempt to gain stability and security through the amassing of wealth and power, and that the feelings of insecurity and instability that lead to this competitive anti-social behaviour are themselves caused by the fear of death.[54] False religion, fostering the fear of death, and made possible by language, then, is the cause of the descent into strife and violence. Thus, the misapplication of reason to naturally arising words, producing false ideas, is heavily implicated in the ending of the first societies and their replacement by cities, with all their problems, and so the origins of language can be seen to be crucial to the Epicurean view of justice, both in prehistory and in the present.

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[54] Phld. *De Piet.* 1190 ff., 1702 ff. with Obbink 491 ff., 549 ff.; Blickman, 1989, 174–7.

Lucretius, *De Rerum Natura*
Book Five, Lines 722–1104

SIGLA

A	Codex Vaticanus 3276
B	Codex Vaticanus Barberinus lat. 154
C	Codex Cantabrigiensis
G	Schedae Gottorpienses
Ital.	codices vel editores Itali saeculi XV vel XVI
L	Codex Laurentianus xxxv. 30
l.31	Codex Laurentianus xxxv. 31
Mon.	Codex Monacensis
O	Codex Leidensis 30 (Oblongus)
[P]	consensus codicum ABCLl.31, Poggiani lectionem indicans
Q	Codex Leidensis 94 (Quadratus)
U	Schedae Vindobonenses (II)
V	Schedae Vindobonenses (I)

Quod superest, quoniam magni per caerula mundi
qua fieri quicquid posset ratione resolvi,
solis uti varios cursus lunaeque meatus
noscere possemus quae vis et causa cieret,
quove modo possent offecto lumine obire
et neque opinantis tenebris obducere terras,
cum quasi conivent et aperto lumine rursum
omnia convisunt clara loca candida luce,
nunc redeo ad mundi novitatem et mollia terrae
arva, novo fetu quid primum in luminis oras
tollere et incertis crerint committere ventis.
  Principio genus herbarum viridemque nitorem
terra dedit circum collis camposque per omnis,
florida fulserunt viridanti prata colore,
arboribusque datumst variis exinde per auras
crescendi magnum immissis certamen habenis.
ut pluma atque pili primum saetaeque creantur
quadrupedum membris et corpore pennipotentum,
sic nova tum tellus herbas virgultaque primum
sustulit, inde loci mortalia saecla creavit
multa modis multis varia ratione coorta.
nam neque de caelo cecidisse animalia possunt
nec terrestria de salsis exisse lacunis.
linquitur ut merito maternum nomen adepta
terra sit, e terra quoniam sunt cuncta creata.
multaque nunc etiam exsistunt animalia terris
imbribus et calido solis concreta vapore;
quo minus est mirum si tum sunt plura coorta
et maiora nova tellure atque aethere adulta.
  Principio genus alituum variaeque volucres
ova relinquebant exclusae tempore verno,
folliculos ut nunc teretes aestate cicadae
linquunt sponte sua victum vitamque petentes.
tum, tibi, terra dedit primum mortalia saecla.
multus enim calor atque umor superabat in arvis.

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776 possent *add. ed. Brixiensis*   782 tollere et *Pontanus*: tolleret *OQ* crerint *Orelli*: credunt *OQ*   800 maiora *Pontanus*: maiore *OQ*

hoc ubi quaeque loci regio opportuna dabatur,
crescebant uteri terram radicibus apti;
quos ubi tempore maturo patefecerat aetas
infantum, fugiens umorem aurasque petessens,
convertebat ibi natura foramina terrae
et sucum venis cogebat fundere apertis
consimilem lactis, sicut nunc femina quaeque
cum peperit, dulci repletur lacte, quod omnis
impetus in mammas convertitur ille alimenti.
terra cibum pueris, vestem vapor, herba cubile
praebebat multa et molli lanugine abundans.
at novitas mundi nec frigora dura ciebat
nec nimios aestus nec magnis viribus auras.
omnia enim pariter crescunt et robora sumunt.
Quare etiam atque etiam maternum nomen adepta
terra tenet merito, quoniam genus ipsa creavit
humanum atque animal prope certo tempore fudit
omne quod in magnis bacchatur montibu' passim,
aeriasque simul volucres variantibu' formis.
Sed quia finem aliquam pariendi debet habere,
destitit, ut mulier spatio defessa vetusto.
mutat enim mundi naturam totius aetas,
ex alioque alius status excipere omnia debet,
nec manet ulla sui similis res: omnia migrant,
omnia commutat natura et vertere cogit.
namque aliud putrescit et aevo debile languet,
porro aliud succrescit et e contemptibus exit.
sic igitur mundi naturam totius aetas
mutat, et ex alio terram status excipit alter,
quod tulit ut nequeat, possit quod non tulit ante.
Multaque tum tellus etiam portenta creare
conatast mira facie membrisque coorta,
androgynum, interutrasque nec utrum, utrimque remotum,

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809 aetas *Marullus*: aestas *OQ*: aestus *Lachmann* 823 animal *Marullus*: anima *OQ*: animas *O corr.* 825 aeriasque *Marullus*: aeriaeque *OQ* 833 succrescit *Lachmann*: crescit *OQ* 836 tulit ut *Bentley*: potuit *OQ*: pote uti *Lachmann*: quiit ut *Ernout* 839 androgynum *Lachmann*: androgynem *OQ* interutrasque *Munro*: interutraque nec utrum utrimque *Lachmann*: inter utras nec utramque (ut utrumque *O*) *OQ*: interutras necutrumque utrimque *Diels*

orba pedum partim, manuum viduata vicissim,
muta sine ore etiam, sine vultu caeca reperta,
vinctaque membrorum per totum corpus adhaesu,
nec facere ut possent quicquam nec cedere quoquam
nec vitare malum nec sumere quod foret usus.
cetera de genere hoc monstra ac portenta creabat,
nequiquam, quoniam natura absterruit auctum
nec potuere cupitum aetatis tangere florem
nec reperire cibum nec iungi per Veneris res.
multa videmus enim rebus concurrere debere,
ut propagando possint procudere saecla:
pabula primum ut sint, genitalia deinde per artus
semina qua possint membris manare remissis,
feminaque ut maribus coniungi possit habere
mutua qui mutent inter se gaudia uterque.
  Multaque tum interiisse animantum saecla necessest
nec potuisse propagando procudere prolem.
nam quaecumque vides vesci vitalibus auris,
aut dolus aut virtus aut denique mobilitas est
ex ineunte aevo genus id tutata reservans.
multaque sunt, nobis ex utilitate sua quae
commendata manent, tutelae tradita nostrae.
principio genus acre leonum saevaque saecla
tutatast virtus, vulpis dolus et fuga cervos.
at levisomna canum fido cum pectore corda
et genus omne quod est veterino semine partum
lanigeraeque simul pecudes et bucera saecla
omnia sunt hominum tutelae tradita, Memmi.
nam cupide fugere feras pacemque secuta
sunt et larga suo sine pabula parta labore,
quae damus utilitatis eorum praemia causa.
at quis nil horum tribuit natura, nec ipsa
sponte sua possent ut vivere nec dare nobis
utilitatem aliquam quare pateremur eorum

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841 muta *Naugerius*: multa *OQ* 844 foret *Lambinus*: volet *OQ*
850 procudere *l.31*: procludere *OQ* 852 remissis *OQ*: remissa *Lachmann* 853 maribus *l.31*: marius *OQ* habere *OQ*: avere *Lachmann*
854 mutent *Bernays*: metuent *OQ*: mutuaque insinuent *Lachmann*
859 tutata *ed. Brixiensis*: tuta *OQ* 865 veterino *Nonius*: veteri non *OQ*
868 secuta *Lambinus*: secutae *OQ* 871 nil *Pontanus*: ni *O*: in *Q*

praesidio nostro pasci genus esseque tutum,
scilicet haec aliis praedae lucroque iacebant
indupedita suis fatalibus omnia vinclis,
donec ad interitum genus id natura redegit.
Sed neque Centauri fuerunt, nec tempore in ullo
esse queunt duplici natura et corpore bino
ex alienigenis membris compacta potestas,
hinc illinc par vis, ut sat par esse potissit.
id licet hinc quamvis hebeti cognoscere corde:
principio circum tribus actis impiger annis
floret equus, puer haudquaquam; nam saepe etiam nunc
ubera mammarum in somnis lactantia quaeret.
post ubi equum validae vires aetate senecta
membraque deficiunt fugienti languida vita,
tum demum puerili aevo florente iuventas
occipit et molli vestit lanugine malas.
ne forte ex homine et veterino semine equorum
confieri credas Centauros posse neque esse,
aut rabidis canibus succinctas semimarinis
corporibus Scyllas et cetera de genere horum,
inter se quorum discordia membra videmus;
quae neque florescunt pariter nec robora sumunt
corporibus neque proiciunt aetate senecta
nec simili Venere ardescunt nec moribus unis
conveniunt, neque sunt eadem iucunda per artus:
quippe videre licet pinguescere saepe cicuta
barbigeras pecudes, homini quae est acre venenum.
flamma quidem vero cum corpora fulva leonum
tam soleat torrere atque urere quam genus omne
visceris in terris quodcumque et sanguinis exstet,
qui fieri potuit, triplici cum corpore ut una,
prima leo, postrema draco, media ipsa, Chimaera
ore foras acrem flaret de corpore flammam?

881 par vis ut sat par *Giussani*: parvis ut non sit (sat *Q*) pars *OQ*: partis ut si par *Lachmann*: partis ut sat par *Bailey*: visque ut non sat par *Munro*: partis ut non par *Brieger* 885 lactantia *l.31*: laetantia *OQ* 888 florente *l.31*: florenta *OQ*: florere *Diels*: florensque *Cassata* 889 occipit *Marullus*: officit *OQ*: sufficit *Merrill* 892 rabidis *Heinsius*: rapidis *OQ* 896 proiciunt *Turnebus*: proficiunt *OQ* 901 vero *add. ed. Juntina*, denique *ante* flamma *Lachmann* 906 foras *Naugerius*: feras *OQ*

quare etiam tellure nova caeloque recenti
talia qui fingit potuisse animalia gigni,
nixus in hoc uno novitatis nomine inani,
multa licet simili ratione effutiat ore,
aurea tum dicat per terras flumina vulgo
fluxisse et gemmis florere arbusta suesse
aut hominem tanto membrorum esse impete natum,
trans maria alta pedum nisus ut ponere posset
et manibus totum circum se vertere caelum.
nam quod multa fuere in terris semina rerum
tempore quo primum tellus animalia fudit,
nil tamen est signi mixtas potuisse creari
inter se pecudes compactaque membra animantum,
propterea quia quae de terris nunc quoque abundant
herbarum genera ac fruges arbustaque laeta
non tamen inter se possunt complexa creari,
sed res quaeque suo ritu procedit et omnes
foedere naturae certo discrimina servant.
At genus humanum multo fuit illud in arvis
durius, ut decuit, tellus quod dura creasset,
et maioribus et solidis magis ossibus intus
fundatum, validis aptum per viscera nervis,
nec facile ex aestu nec frigore quod caperetur
nec novitate cibi nec labi corporis ulla.
multaque per caelum solis volventia lustra
vulgivago vitam tractabant more ferarum.
nec robustus erat curvi moderator aratri
quisquam, nec scibat ferro molirier arva
nec nova defodere in terram virgulta neque altis
arboribus veteres decidere falcibu' ramos.
quod sol atque imbres dederant, quod terra crearat
sponte sua, satis id placabat pectora donum.
glandiferas inter curabant corpora quercus
plerumque; et quae nunc hiberno tempore cernis
arbuta puniceo fieri matura colore,
plurima tum tellus etiam maiora ferebat.

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914 ponere *Q corr.*: pondere *OQ*: pandere *Avancius* 923 res *Munro*: si *OQ*: sic *Pontanus*: vis *Lachmann*: sibi *Merrill* 925 at *Lachmann*: et *OQ* 934 molirier *ed. Brixiensis*: mollerier *O* 941 arbuta *O corr.*: arvita *OQ*

multaque praeterea novitas tum florida mundi
pabula dura tulit, miseris mortalibus ampla.
at sedare sitim fluvii fontesque vocabant,
ut nunc montibus e magnis decursus aquai
claru' citat late sitientia saecla ferarum.
denique nota vagis silvestria templa tenebant
nympharum, quibus e scibant umori' fluenta
lubrica proluvie larga lavere umida saxa,
umida saxa super viridi stillantia musco,
et partim plano scatere atque erumpere campo.
necdum res igni scibant tractare neque uti
pellibus et spoliis corpus vestire ferarum,
sed nemora atque cavos montis silvasque colebant
et frutices inter condebant squalida membra
verbera ventorum vitare imbrisque coacti.
nec commune bonum poterant spectare neque ullis
moribus inter se scibant nec legibus uti.
quod cuique obtulerat praedae fortuna, ferebat
sponte sua sibi quisque valere et vivere doctus.
et Venus in silvis iungebat corpora amantum;
conciliabat enim vel mutua quamque cupido
vel violenta viri vis atque impensa libido
vel pretium, glandes atque arbuta vel pira lecta.
et manuum mira freti virtute pedumque
consectabantur silvestria saecla ferarum
missilibus saxis et magno pondere clavae; [975]
multaque vincebant, vitabant pauca latebris; [968]
saetigerisque pares subus silvestria membra [969]
nuda dabant terrae nocturno tempore capti, [970]
circum se foliis ac frondibus involventes. [971]
nec plangore diem magno solemque per agros [972]
quaerebant pavidi palantes noctis in umbris, [973]
sed taciti respectabant somnoque sepulti, [974]
dum rosea face sol inferret lumina caelo.

947 claru' citat *Forbiger* late *Bosius*: claricitati a te *OQ*: clarigitat late *Lachmann* 948 nota vagis *OQ*: nota vagi *Lachmann*: noctivagi *Naugerius*: nocte vagi *Bentley* tenebant *OQ*: petebant *Brieger* 949 umori' *Bentley*: umore *OQ* 953 scibant *AB*: scribant *OQU*: sciebant *Q corr.* 959 scibant *AB*: sciebant *OQU* 962 iungebat [*P*]: lugebat *O*: lucebat *QU* 965 arbita *O. corr*: arvita *OQU* 968 [975] *huc transposuit Naugerius* 971 nuda dabant *Lambinus*: nudabant *OQ* 976 rosea *l.31*: rotea *OQ*

a parvis quod enim consuerant cernere semper
alterno tenebras et lucem tempore gigni,
non erat ut fieri posset mirarier umquam
nec diffidere ne terras aeterna teneret
nox in perpetuum detracto lumine solis.
sed magis illud erat curae quod saecla ferarum
infestam miseris faciebant saepe quietem.
eiectique domo fugiebant saxea tecta
spumigeri suis adventu validique leonis
atque intempesta cedebant nocte paventes
hospitibus saevis instrata cubilia fronde.
Nec nimio tum plus quam nunc mortalia saecla
dulcia linquebant lamentis lumina vitae.
unus enim tum quisque magis deprensus eorum
pabula viva feris praebebat dentibus haustus,
et nemora ac montis gemitu silvasque replebat
viva videns vivo sepeliri viscera busto.
at quos effugium servarat corpore adeso,
posterius tremulas super ulcera taetra tenentes
palmas horriferis accibant vocibus Orcum,
donec eos vita privarant vermina saeva
expertis opis, ignaros quid vulnera vellent.
at non multa virum sub signis milia ducta
una dies dabat exitio nec turbida ponti
aequora lidebant navis ad saxa virosque,
tum temere incassum frustra mare saepe coortum
saevibat leviterque minas ponebat inanis,
nec poterat quemquam placidi pellacia ponti
subdola pellicere in fraudem ridentibus undis.
improba navigii ratio tum caeca iacebat.
tum penuria deinde cibi languentia leto
membra dabat, contra nunc rerum copia mersat.
illi imprudentes ipsi sibi saepe venenum
vergebant, nunc dant aliis sollertius ipsi.

979 posset *OQ*: possent *Brieger* 984 eiectique *l.31*: et lectique *O*: electique *Q* 994 at *OQ*: et *Brieger* 995 ulcera *l.31*: vicerat *OQ* 997 donec *Marullus*: denique *OQ*: donique *Vossius* 1002 tum *M. F. Smith*: nec *OQ*: sed *Lambinus*: hic *Lachmann*: sic *Diels* 1003 ponebat *Marullus*: potebas *OQ* 1009 imprudentes *Marullus*: prudentes *OQ* 1010 nunc dant aliis *ed. Juntina*: nudant *OQ*: nunc se nudant *Lachmann*: nunc dant letum *l.31*: nurui nunc dant *Munro*: nunc dant soceris *Diels*

Inde casas postquam ac pellis ignemque pararunt,
et mulier coniuncta viro concessit in unum
conubium, prolemque ex se videre creatam,
tum genus humanum primum mollescere coepit.
ignis enim curavit ut alsia corpora frigus
non ita iam possent caeli sub tegmine ferre,
et Venus imminuit viris puerique parentum
blanditiis facile ingenium fregere superbum.
tunc et amicitiem coeperunt iungere aventes
finitimi inter se nec laedere nec violari,
et pueros commendarunt muliebreque saeclum,
vocibus et gestu cum balbe significarent
imbecillorum esse aequum misererier omnis.
nec tamen omnimodis poterat concordia gigni,
sed bona magnaque pars servabat foedera caste;
aut genus humanum iam tum foret omne peremptum
nec potuisset adhuc perducere saecla propago.
At varios linguae sonitus natura subegit
mittere et utilitas expressit nomina rerum,
non alia longe ratione atque ipsa videtur
protrahere ad gestum pueros infantia linguae,
cum facit ut digito quae sint praesentia monstrent.
sentit enim vis quisque suas quoad possit abuti.
cornua nata prius vitulo quam frontibus extent,
illis iratus petit atque infestus inurget.
at catuli pantherarum scymnique leonum
unguibus ac pedibus iam tum morsuque repugnant,
vix etiam cum sunt dentes unguesque creati.
alituum porro genus alis omne videmus
fidere et a pinnis tremulum petere auxiliatum.
proinde putare aliquem tum nomina distribuisse
rebus et inde homines didicisse vocabula prima,
desiperest. nam cur hic posset cuncta notare
vocibus et varios sonitus emittere linguae,

post 1012 *lacunam indicavit Marullus* 1013 conubium *Lachmann*: cognita sunt *OQ*: coniugium *Bernays* 1019 aventes *Q*: abentes *O*: habentes *O corr.* 1023 omnis *Marullus*: omni *OQ* 1025 caste *l.31*: casti *OQ* 1032 monstrent *Marullus*: monstret *OQ* 1033 quoad *Lambinus*: quod *OQ* 1035 infestus *Q*: infessus *OQ corr.* 1038 etiam *Marullus*: iam *O*: tiam *Q*

tempore eodem alii facere id non quisse putentur?
praeterea si non alii quoque vocibus usi
inter se fuerant, unde insita notities est
utilitatis et unde data est huic prima potestas,
quid vellet facere ut sciret animoque videret?
cogere item pluris unus victosque domare
non poterat, rerum ut perdiscere nomina vellent.
nec ratione docere ulla suadere surdis,
quid sit opus facto, facilest; neque enim paterentur
nec ratione ulla sibi ferrent amplius auris
vocis inauditos sonitus obtundere frustra.
postremo quid in hac mirabile tantoperest re,
si genus humanum, cui vox et lingua vigeret,
pro vario sensu varia res voce notaret?
cum pecudes mutae, cum denique saecla ferarum
dissimilis soleant voces variasque ciere,
cum metus aut dolor est et cum iam gaudia gliscunt.
quippe etenim licet id rebus cognoscere apertis.
irritata canum cum primum magna Molossum
mollia ricta fremunt duros nudantia dentes
longe alio sonitu rabie restricta minantur
et cum iam latrant et vocibus omnia complent.
at catulos blande cum lingua lambere temptant
aut ubi eos iactant pedibus morsuque petentes
suspensis teneros imitantur dentibus haustus,
longe alio pacto gannitu vocis adulant
et cum deserti baubantur in aedibus aut cum
plorantes fugiunt summisso corpore plagas.
denique non hinnitus item differre videtur,
inter equas ubi equus florenti aetate iuvencus
pinnigeri saevit calcaribus ictus Amoris
et fremitum patulis sub naribus edit ad arma,
et cum sic alias concussis artubus hinnit?
postremo genus alituum variaeque volucres,
accipitres atque ossifragae mergique marinis

1053 facilest *Lachmann*: facile si *OQ*: faciles *l.31* 1058 varia *Bentley*: varias *OQ* 1062 id *Gifanius*: in *OQ* 1064 fremunt *Marullus*: premunt *OQ* 1065 alio *l.31*: alia *OQ* restricta *Lachmann*: stricta *OQ* 1067 at *Lachmann*: et *OQ* 1068 iactant *Naugerius*: lactant *OQ* 1071 deserti baubantur *L*: desertibus aubantur *OQ*

fluctibus in salso victum vitamque petentes,
longe alias alio iaciunt in tempore voces
et cum de victu certant praedaeque repugnant.
et partim mutant cum tempestatibus una
raucisonos cantus, cornicum ut saecla vetusta
corvorumque greges ubi aquam dicuntur et imbris
poscere et interdum ventos aurasque vocare.
ergo si varii sensus animalia cogunt,
muta tamen cum sint, varias emittere voces,
quanto mortalis magis aequumst tum potuisse
dissimilis alia atque alia res voce notare.
   Illud in his rebus tacitus ne forte requiras,
fulmen detulit in terram mortalibus ignem
primitus, inde omnis flammarum diditur ardor.
multa videmus enim caelestibus insita flammis
fulgere, cum caeli donavit plaga vapore.
et ramosa tamen cum ventis pulsa vacillans
aestuat in ramos incumbens arboris arbor,
exprimitur validis extritus viribus ignis,
emicat interdum flammai fervidus ardor,
mutua dum inter se rami stirpesque teruntur.
quorum utrumque dedisse potest mortalibus ignem.
inde cibum coquere ac flammae mollire vapore
sol docuit, quoniam mitescere multa videbant
verberibus radiorum atque aestu victa per agros.

1082 praedaeque *Avancius*: praedataque *OQ*: praedaque *O corr.* 1091–1160 *uncinis incl. Lachmann* 1097 arboris *l.31*: ardoris OQ

Lucretius, *On the Nature of the Universe* 5.772–1104

For the next topic: since I have explained the way everything can happen throughout the blue expanses of the great world, so we are able to know what force and cause set in motion the various orbits of the sun and the wanderings of [775] the moon, the way in which they can disappear when their light is obstructed and veil the unsuspecting world with darkness, when they blink as it were, and once again gaze with opened eye on everything shining with clear light, now I [780] return to the youth of the world and the earth's soft fields, and to what in new birth they decided first to bring into the shores of light, and entrust to the changeable winds.

In the beginning the earth gave the race of grasses and shining greenness [785] about the hills and over all the plains; the flowery meadows shone with greening colour, and then to the various trees was given the great struggle of growing up through the breezes with free rein. As feathers, hair, and bristles grow first on the limbs of four-footed creatures and the bodies of those powerful in wing, so [790] first the new earth put forth grasses and bushes, and then created the mortal races which arose in many kinds in many ways by differing methods. For animals cannot have fallen from the sky, and nor can land animals have come out of salt [795] pools. It remains that the earth deservedly gained the name of mother, since from the earth all things were created. And even now many animals arise from the earth, formed by the rains and the warm heat of the sun; so it is less amazing if at [800] that time more and larger animals arose, raised by the new earth and new air.

In the beginning the races of flying things and the various birds left their eggs hatched in spring time, just as now in the summer cicadas leave their polished chrysalises of their own accord seeking life and livelihood. It was at that [805] time, you see, that the earth first gave birth to mortal races, for great heat and moisture abounded in the fields. So, wherever a suitable place was given, wombs grew fastened to the earth by roots, and when in due time the age of the infants [810] had broken these open, fleeing the moisture and seeking the breezes, nature redirected there pores of the earth and forced a juice like milk to flow from open veins, just as now each woman when she has given birth is filled with sweet milk, [815] because the whole flow of nourishment is redirected to her breasts. The earth provided food for the children, the warmth clothed them, and the grass provided a bed abounding with much soft down. But the newness of the earth produced neither harsh cold nor too much heat nor winds of great strength; for all things [820] grow and gain strength at the same time.

Therefore, again and again having gained the name of mother, the earth keeps it deservedly, since she herself created the human and animal race and poured out at almost a fixed time all the animals that romp everywhere in the high [825] mountains, and at the same time the airy flying creatures with their various forms.

But because she must have some end to bearing, she stopped, like a woman worn out by the process of ageing. For time changes the nature of the whole world, and one state of things must take up from another, nor does anything stay [830] the same as it was: all things move, nature transforms everything and forces it to change. For one thing decays and grows weak with feeble age, another grows up and emerges from contempt. Thus, therefore, time changes the nature of the [835] whole world, and one state of the earth takes up from another, so that what bore before no longer can, and what could not bear before now can.

The earth tried also to create many monsters at that time which arose with amazing appearance and limbs: the man-woman, between both yet neither, and [840] different from both. Some were found bereft of feet, others in turn bereft of hands, also dumb without mouths and blind without faces, and bound by the adhesion of their limbs all along their bodies, so that they could not do anything or go anywhere, nor avoid evils, [845] nor take up what was of use. She created other kinds of these monsters and portents, in vain since nature forbade their growth, nor were they able to reach the desired flower of age, nor find food, nor be joined through the works of Venus. For we see that many things need to come together in creatures for them to be [850] able to forge a race by breeding: firstly that there is food, then secondly that they have a way by which their generative seeds can trickle through the limbs when the members have relaxed, and thirdly so that females may be able to be joined to males, that they have the physical means whereby they can both exchange mutual joys between themselves.

[855] And it is inevitable that many species of living creatures became extinct at that time and that they were not able to found a race by breeding. For whatever you see grazing on the life-giving breezes, either cunning or strength or finally speed has kept that species safe since the origins of its birth: and there are many [860] which remain, entrusted to our protection, commended to us by their usefulness. Firstly the fierce race of lions, that savage species, has been kept safe by strength, the fox by cunning, and the deer by speed in flight. But the light-sleeping minds of dogs with their faithful hearts, and the whole race born of the [865] load-bearing seed of horses, and at the same time the wool-bearing flocks and the horned races of cattle, all were entrusted to our tutelage, Memmius: because they eagerly fled the wild beasts and sought peace and the plentiful fodder, born [870] by no labour of theirs, which we give them as a reward on account of their usefulness.

But those to whom nature granted none of these attributes, so they could neither live by their own resources nor give to us any usefulness by which we might allow their species to graze under our protection and be safe, clearly these lay [875] exposed as prey and profit to others, all hobbled by their bonds of fate, until nature brought that species to extinction.

But neither have there ever been Centaurs, nor at any time are creatures able to exist with a double nature and twofold body, their power put together from [880] alien-born limbs, their strength equal on both sides, so that it could be equal enough. This can be understood from the following by even the dullest intellect.

Firstly, the lively horse flourishes at about three years of age, the boy by [885] no means; for often even at that age he will seek in his sleep the rich milkiness of the breast. Later when the powerful strength of the horse fails from old age and his limbs become weak as life flees, then at last in boyhood's flourishing age youth begins and clothes his cheeks with soft down. Do not [890] believe then that perchance Centaurs are possible or can exist put together from a human and the load-bearing seed of horses, nor that Scyllas can exist with half-fish bodies girdled with rabid dogs, nor the rest of that kind of creature whose limbs we see to be incompatible with one another, which neither flourish at [895] the same time, nor reach physical maturity together, nor fail in old age together, nor burn with the same passion of Venus, nor come together with a single lifestyle, nor find the same things pleasant for the bodies. Indeed you can [900] often see beard-bearing goats grow fat on hemlock, which is deadly poison to a human. Again since fire scorches and burns the yellow bodies of lions as much as the bodies of all species made of flesh and blood that exist in the world, how [905] can it be that a three-in-one-bodied creature, front lion, back serpent, the Chimaera itself in the middle, could breathe out fierce flame from its body?

And so as well, someone who pretends that such animals could have been born from the new earth and fresh sky, relying on this one empty word [910] 'newness', is likely to babble many such things from a similar argument, saying that golden rivers used commonly to flow at that time through the land, and that trees used to flower with jewels, or that a man was born with such stretch of [915] limb that he could place his stride across the deep sea and turn the whole sky around him with his hands. For the fact that there were many seeds of things in the soil at the time when the earth first poured forth animals, is however no indication that intermixed creatures were able to be created or the [920] limbs of separate creatures stuck together, because the species which even now spring forth from the earth, the grasses, corn, and joyful trees, are not however able to be created intermingled together, but each thing proceeds according to its own habit, and all things keep their distinctions by a fixed law of nature.

[925] But that human race was much hardier in the fields, as was fitting, since the hard earth had created them, and they were built on larger and more solid bones within, fixed through their flesh by powerful sinews, nor were they easily [930] able to be harmed by heat or cold, nor unusual food nor by any bodily

failing. And for many rolling cycles of the sun through the heavens they led a life in the wide-wandering manner of wild beasts. Nor was anyone a tough guider of the curved plough, nor did anyone know how to work the fields with iron, nor to plant [935] new shoots in the ground, nor to prune old branches from high trees with sickles. What the sun and showers had given, what the earth had created of her own accord, this was a pleasing enough gift for their hearts. Among the acorn-bearing oaks [940] they cared for their bodies for the most part; and the arbute berries you now see ripening in winter time with crimson Punic colour, at that time the earth bore most abundantly and larger than now. And the flowery newness of the world then bore much tough fodder besides, ample for poor mortals.

[945] But to quench their thirst the rivers and springs called them, just as now the waters rushing down from the high mountains call afar loud and clear the thirsting races of wild animals. And then they stayed in the woodland temples of the nymphs known to them from their wanderings, from where they knew gliding [950] waters flowed and washed the wet rocks with a great gush, washed the wet rocks dripping above with green moss, and in some cases burst out and gushed onto the level plain.

Not yet did they know how to treat things with fire nor to use animal skins and dress their bodies in the pelts of wild beasts, but they lived in glades and [955] mountain caves and woods, and hid their rough bodies among the bushes, driven to avoid the lashing of wind and rain.

Nor were they able to look to the common good, nor to use any customs or [960] laws among themselves. What booty fortune had obtained for each person, each carried off at will for themselves, taught to live for himself and so to be strong.

And Venus joined the bodies of lovers in the woods, each woman won over either by mutual desire, or the violent force of men and their boundless lust, or [965] bribery—acorns and arbute berries or choice pears.

And relying on amazing powers of hand and foot, they chased the woodland races of wild beasts with stones as missiles and with clubs of great weight. Many of them they overcame, they avoided a few in their lairs.

[970] And like bristly boars, when overcome by night-time, they threw their woodland limbs naked to the ground, wrapping leaves and branches around themselves. Nor did they go seeking the day and the sun with great wailing through the fields, wandering panic-stricken in the shadows of night, but silently [975] they waited entombed in sleep until the sun with its rosy torch brought light into the sky. For since they were used from childhood to seeing light and dark arise at alternate times, it was not possible that they should ever be amazed nor [980] that they should fear that when the light of the sun was taken away, eternal night would hold the earth for ever. But it was a greater care for them that the races of wild beasts would often make sleep dangerous to the poor wretches: and turned out of their home they would flee their rocky roofs at the coming of a [985] foam-bearing boar or of a powerful lion, and panicking in unseasonable night would yield their leaf-strewn beds to their savage guests.

Not much more then than now did mortals leave the sweet light of life [990] with laments. Each one then was more likely to be seized individually and provide living fodder for wild beasts, devoured by their teeth, and they would fill the glades and mountains and woods with groaning, seeing their living flesh buried in a living tomb. But those whom flight saved with half-eaten body, [995] afterwards, holding trembling hands over foul sores, would summon Orcus with dreadful cries until writhing torments deprived them of life, bereft of aid, ignorant of what wounds needed. But, a single day did not bring destruction to [1000] many thousands of men led under the standards, nor did the turbulent waves of the sea smash ships and men on the rocks. Then, at random, pointlessly, frustrated, the sea would often rise and rage and lightly lay its empty threats, nor [1005] could the seductive deceptions of the placid sea with its laughing waters entice anyone to their ruin. Then the wicked art of sailing lay hidden. Then scarcity of food gave their languishing limbs to death; now abundance drowns us. They themselves unwitting often poured poison for themselves; now more [1010] cunningly they themselves poison others.

Then, after they had got huts and skins and fire for themselves, and woman joined to man had retired into a single marriage, and they saw children created from them, then it was that the human race first began to soften. For fire [1015] saw to it that their now tender bodies were unable to bear the cold under the open sky as they had before, and Venus lessened their violence, and children with their winning ways easily broke the arrogant nature of their parents. And then eager neighbours began to form friendship pacts with one another neither to [1020] harm nor be harmed, and they entrusted children and the female race to each other's care, signing with cries and halting gestures that it is right for all to pity the weak. It was not possible however for complete concord to arise, but a great [1025] part kept the pacts with integrity, or already at that time the human race would have been completely destroyed, nor would their offspring have been able to prolong the race to this day.

But nature forced them to send out the various sounds of the tongue, and usefulness forced out the names of things, in no very different way than [1030] speechlessness of the tongue is seen to drive children to gesture when it makes them point out what things are present with a finger. For each creature feels how far it is able to use it powers. Before the horns stand out on the head of a calf, [1035] when annoyed, he attacks with them and butts aggressively; and panther kittens and lion cubs already fight with claws and paws and bites when their teeth and claws have scarcely been created. Further, we see all the races of flying [1040] creatures trust their wings and seek trembling aid from them.

Accordingly, to think that someone at that time distributed names to things and that people learned the names from him is stupid. For how would he have been able to note everything with words and emit the various sounds of the tongue [1045] but others be thought not to have been capable of this at the same time?

Besides, if the others as well had not used these names among themselves, from where was implanted the pre-existing notion of their usefulness, and from where was the first ability given to this man to know what he wanted to do and see it in [1050] his mind? One man could not force many and master and dominate them so that they would want to memorize the names of things; nor is it easy to teach the deaf in any way and persuade them what needs to be done; for they would not [1055] have put up with or suffered in any way him beating their ears in vain with unfamiliar sounds.

Finally, what is so very amazing in this matter, if the human race, who had a vigorous voice and tongue, should have marked things with various sounds according to various feelings, when dumb animals, even wild beasts, usually [1060] utter different and variable voices when they are in fear or grief, or again when joy bursts out? Really, you can learn this from obvious facts.

When Molossian hounds are annoyed and their great flabby jaws first [1065] begin to growl with hard teeth bared, with their rage in check they threaten with a far different sound from when they bark and fill everywhere with their voice. But when they set out to fondly lick their puppies with their tongue, or when they throw them with their paws and nipping them they pretend to bite them [1070] gently with teeth checked, they fawn over them with yelps in a far different way from when they howl deserted in the house, or differently from when they whimper as they flee cringing from blows.

Again, does there not also seem to be a different whinnying when a [1075] young stallion in the flower of his youth raves amongst the mares struck by the spurs of winged Love and snorts from wide nostrils for the contest, and the way he whinnies when struck otherwise in the limbs?

Finally, the race of birds and the varied flying creatures, hawks, and [1080] lammergeyers, and sea-divers seeking life and livelihood in the salt waves, cry out at other times sounds far different than when they fight over food and when their prey fights back. And some birds alter their harsh-sounding song along [1085] with the weather, such as the ancient races of crows and flocks of rooks when they are said to call for water and showers, and sometimes summon winds and breezes.

Therefore, if various feelings force animals, dumb though they are, to give out varied voices, how much more likely is it that at that time mortals were able to [1090] mark out different things with one sound or another!

In case in these arguments you may be silently asking; it was lightning that first brought down fire to the earth for mortals, and from this all burning flames were spread. For we see many things burning instilled with celestial [1095] flames when a blow from heaven has given them heat. And yet when a branchy tree burns, driven by the winds, swaying and leaning against the branches of another tree, fire is forced out by the powerful forces of friction, and the [1100] burning heat of flame flashes out sometimes while the branches and trunks are rubbed together. Either of these is able to have given fire to mortals.

Then the sun taught them to cook food, and to soften it with the heat of flame, since they saw many things grow soft overcome in the fields by the blows and heat of the sun's rays.

COMMENTARY

§1 Lines 772–782: Bridge from Astronomy to Zoogony

'Because I have explained the motions of the heavens, and shown that they are not due to divine control, I now return to where I left off before, and explain the origins of life.'

As is traditional, the zoogony is a function of the cosmogony since they both occur by the same mechanism, and have the same random uncontrolled collisions of atoms as their basis. This viewing of zoogony and cosmogony as part of the same process is familiar from Presocratic sources (cf. Empedocles DK31 B17 plus Strasbourg fr. a, Anaximander DK12 A30, Archelaus DK60 A4, and Democritus DK68 A139 = Usener Epicurus fr. 333). We should perhaps expect, then, that the zoogony should follow the cosmogony directly, and this is what we seem to be promised in 5.67–70 (cf. 5.429–31 ≈ 2.1061–3). Sedley (1998, 122–3, 152–4) considers that L. follows the order of topics he found in Epicurus' *Περὶ Φύσεως* 11–12 and that E. had adopted it in order to argue point by point against Plato's *Timaeus*, where we find the same sequence (42b ff., 91a ff.), and that had L. lived to revise book five he would have moved the astronomy to after the prehistory, thereby avoiding the interruption of the sequence of chronological development (cf. the ordering in *Ep. Hdt.* 75 ff. with astronomy after the origins of language. M. F. Smith's placing of Diogenes of Oinoanda fr. 13 (on astronomy) after fr. 12 (on human evolution) cannot be used as evidence either way, since Smith used *Ep. Hdt.* 75 ff. to order these Diogenes fragments (1993, 100)). In *Timaeus* this order is natural since Plato presents the birth of the stars as one facet of zoogony, describing them as one of the four types of living creature that the world needs in order to be complete, the other three being birds, land animals, and sea-creatures. Thus, an explanation of the movements of stars and planets sits comfortably within the zoogony.

The order found in L. is also natural, since the stars and planets are formed by the same process as the earth, air, and sea (5.416 ff.), thus the birth of the stars is a part of the cosmogony: the atoms form compounds, which by the process of attraction of like to like separate out from one another and go to form the four parts of the world: earth, the heaviest, sinks down, water, next heaviest, above that, air rises up, and *aether*, lightest of all, rises highest and forms the stars and planets. The description takes us on an upward journey, which matches the chronological sequence of creation, and the rising up of the *aether* beyond the storms of the air is the reason given for the smooth flowing progression of the heavens. This is the crucial point that the astronomy needs to make: that the regular motions of the stars do not reflect any divine control of the world, since the origins of religion lie in a false judgement that the gods control the universe, which arises from observation of the order of the heavens and a failure to apply the correct *ratio* (5.76 ff. and 5.1183). Further, L. makes it clear in 5.416–18, introducing the cosmogony, that the astronomy will follow. It is the orbits of the sun and moon that are to be explained by the following cosmogony, not simply their origins, and so it is valuable in didactic terms for L. that astronomy should follow the cosmogony. Thus, being part of the anti-teleological programme, this order, with astronomy following closely on cosmogony, may be originally Democritean (cf. the report of Leucippus DK67 A1 (Diog. Laert. 9.31)), or alternatively an even earlier Presocratic order as fr. DK28 B10 (Clement *Strom.* 5.138) of Parmenides suggests. He promises to present an explanation of the movements of the stars as part of his exposition of their births and natures. Cf. also DK60 A4 where Archelaus is also reported as if he presented the astronomy between the cosmogony and the zoogony. Plato in *Timaeus* may then have appropriated the Presocratic ordering of topics, the better to subvert it (see Campbell, 2000, and my review of Sedley in Campbell, 1999).

780. nunc redeo: *nunc redeo*, along with similar phrases, is a fairly common didactic formula signalling a return to a topic in philosophy (e.g. Cic. *Ad Att.* 5.11.6.1, *De Orat.* 2.307.1, *De Am.* 1.12), and in history (e.g. Sall. *Jug.* 4.9). It is found in Latin poetry also in Hor. *Sat.* 1.6.45, but Empedocles DK31 B35.1–2 has the similar *αὐτὰρ ἐγὼ παλίνορσος ἐλεύσομαι ἐς πόρον ὕμνων* | *τὸν πρότερον κατέλεξα*, 'But I shall turn back to the path of song I traced before, leading off from one argument this argument'. L. uses it only here, where it is forced upon him by the intervention of the astronomy between the cosmogony and zoogony (see above). It works in three ways: logically, as a return to a topic, chronologically as a return to the beginning of the world, and geographically as a descent to the earth from the stars. In this last way, L.'s return mirrors the return of Epicurus from beyond the flaming ramparts of the world, bringing with him the knowledge of the limits of all things (1.62–79, cf. Manilius *Astron.* 1.118 ff.). This reminds us of Empedocles, and his praise of Pythagoras (DK31 B129), on which 1.62–79 may well be based, and more directly of Empedocles' own journey as *daimon* through the elements, and, in the cosmogonic context, of his descent into the lowest depths of the whirl as our guide to the world under Strife (Strasbourg fr. d M&P). Cf. also 3.14 ff. where Epicurus grants L. the ability to view the entire universe as if transparent (see Kennedy, 2002, 71–2), and Ovid's Pythagoras in *Met.* 15.60 ff. who has this same power. Parmenides' journey to the goddess too (fr. 1) may well serve as a model, for both Lucretius and Empedocles (see Gale, 1994, 52 ff.).

mundi novitatem: the newness of the world and its greater vigour, and thus greater fecundity, is a crucial point in L.'s analogy of the earth as mother (see on 790, 800, 816–19, 826–7), and her ability to produce large animals by spontaneous generation at this time (see below on 797). The phrase occurs again at 5.818 and 5.943, and at 5.909 L. criticizes those who rely on the *novitas* of the world in his refutation of compound creatures and Golden Age *adunata*. *Novitas* would not seem to be a poetic word before L., who uses it 16 times, but it is found twice in Horace at *Ep.* 2.1.90 and *Ars.* 223, and 13 times in Ovid, especially in the *Metamorphoses* (e.g. 2.31, 3.350, 4.284, 7.758, 8.156, 8.681, 11.127, 12.175, 15.408), there often meaning 'strangeness' as well as 'newness', e.g. of the Minotaur at 8.156. Ovid's Pythagoras uses it to characterize his story of the endless flux of all things, and of human and animal ontological instability, linking it with wonder, an attitude to prehistory L. seeks to combat (5.83), *Met.* 15.408: 'si tamen est aliquid mirae novitatis in istis'. L. must steer a path between allowing the newness and strangeness of the young world to aid his argument, and the dangers of it being thought to allow hybrid monsters and mythical beasts, and the sort of inter-species mutation found in the *Metamorphoses* and in *Timaeus* 91 ff. (see below on 878 ff., 907 ff., 1056).

780–1. mollia terrae | arva: the softness of the earth here is at odds with the description of her as *dura* in 926 (cf. 5.1402). L. uses two popular, but opposed, ideas to support two quite different arguments: here we see the more nearly Golden Age view of a soft nurturing Earth-Mother, and at 926 the focus shifts to a harder indifferent earth producing similarly tough humans. Both are neatly summed up by Cic. *Rep.* 3.1.1 (August. *C. Julianum* 4.12.60): 'non ut a matre sed ut a noverca'. Schrijvers (1999, 84) sees a link in both with ancient ideas of the effects of environment on constitution (see on 926 and 1011 ff. below).

This softness of the young earth is stressed again at 816–17, and works in a similar way as in Diodorus Siculus 1.7.1–6, where it is instrumental in the creation of life (see below on 807–8), and in the standard Presocratic idea of the formation of life from a mixture of earth and water, and also in mythical ideas of the moulding of life from the same ingredients (see Appendix A). The earth's softness also aids in the Earth-Mother analogy, and it may also be easier to imagine large creatures being spontaneously generated from soft, rather than hard, earth (Diod. Sic. 1.7.6). This association of softness and earth forms part of an implicit poetic syllabus of the motherhood of the earth in this passage. The ideas of motherhood, softness, wetness, warmth, birth, and nurturing are built up in a cumulative pattern of unmistakable force. Some of the key words are: *mollia terrae arva* (780–1), *fetu* (781), *maternum nomen* (795), *imbribus . . . calido . . . vapore* (798), *adulta* (800), *ova* (802), *tempore verno* (802), *aestate* (803), *vitam* (804), *calor . . . umor* (806), *crescebant uteri* (808), *infantum . . . umorem* (810), *sucum* (812), *lactis . . . femina* (813), *peperit . . . dulci . . . lacte* (814), *mammas . . . alimenti* (815), *cibum . . . pueris vestem vapor . . . cubile* (816), *molli lanugine* (817), *aestus* (819), *maternum nomen* (821).

Originally *arva* = 'ploughland', as in 5.934: '. . . nec scibat ferro molirier arva'. Varro *LL* 5.151: 'arvus et arationes ab arando' (Maltby, 56), cf. Statius *Theb.* 4.278 'nondum arva'. It is, however, often used of pasture or untilled land (*TLL* 2.733.28 ff.). Cf. Hes. *Op.* 117: *ἄρουρα* of the unploughed earth of the Golden Age. This and other words for 'field' are also used of female genitalia (4.1107 *muliebria . . . arva*; *TLL* 2.735.43 ff; Adams, 1982*a*, 82–5) along with the common ploughing/sex metaphor (Adams, 1982*a*, 24, cf. 4.1273). Cf. Empedocles DK31 B66 *σχιστοὺς λειμῶνας . . . Ἀφροδίτης*, 'the divided meadows of Aphrodite'. Vergil, in his description of the coming of spring, and the comparison of the creation of life in the spring of the world in *G.* 2.340–1, uses the word in a similar context: '. . . virumque | terrea progenies *duris* caput extulit *arvis*', and *G.* 2.331: '. . . laxant arva sinus'. Here, just as in the Golden Age, the virgin earth needs no ploughing or sex for her to produce crops because of her greater fertility (5.937–8), and so parthenogenesis/spontaneous generation is possible.

781. **novo fetu:** originally of human or animal offspring, Isid. *Orig.* 11.1.144 'foetus . . . nominatus, quod adhuc in *utero* foveatur' (Maltby, 231), *fetus* is also commonly used as a poetic metaphor for the fruits of the earth, e.g. *DRN* 1.193, 1.209, 1.253, 1.1033, 2.1159, 3.1006, 6.1; Verg. *G.* 1.82, 2.442, 2.521; Ov. *Fasti* 1.694; *Pervigilium Veneris* 61 (*TLL* 6.1.638.55 ff.). Here the earth's fruits will be both plants and animals, and the idea of *birth* is explicit. Perhaps the birth metaphor in *fetus* is dead and, fittingly when speaking of autochthony, exhumed for the context. As with *arva*, the births of plants and animals are linked, and the origin of the first asexually produced life is described in the language of sexual reproduction.

in luminis oras: 'into the shores of light' is an epic phrase describing birth as the crossing of a boundary from dark to light. It is very popular with L., who uses it nine times, 1.22, 1.70, 1.179, 2.577, 2.617, 5.224, 5.781, 5.1389, 5.1455, especially when speaking of the zoogonic forces of the *Magna Mater* (2.617), *Natura* (5.224), and (this and a similar phrase) of Venus, 1.22–3 and 1.227–8. The similar phrase 'shores of *life*' is Empedoclean, but there describing death, where Strife separates the limbs of creatures at their destruction, DK31 B20.5: *πλάζεται ἄνδιχ' ἕκαστα περὶ ῥηγμῖνι βίοιο*, 'they wander, each apart, *about the shores of life*'. In Empedocles, the cyclical nature of his cosmology makes life and death part of the same process, and we may imagine the separated limbs wandering the shores of life waiting until Love puts them back together again at their rebirth (DK31 B20, B57, B59, and B61, with Simpl. *in Phys. CAG* 9.371.33–372.11, and Wright ad loc., M&P 87 ff.). This cycle of birth and death is echoed at *DRN* 5.222–7, with the new-born child thrown up into the *luminis oras* like a drowned shipwrecked sailor.

Empedocles also has the first humans arising from darkness, DK31 B62.1–2:

> *νῦν δ' ἄγ', ὅπως ἀνδρῶν τε πολυκλαύτων τε γυναικῶν*
> *ἐννυχίους ὅρπηκας ἀνήγαγε κρινόμενον πῦρ*

And now hear this—how fire as it was being separated, brought up by night the shoots of men and pitiable women. (Trans. Wright)

Wright (1995, 216) comments:

> ἐννυχίους 'by night' but also of the dead (cf. Soph. *OC* 1558) as ἀνήγαγε of bringing up from the dead (and cf. Hes. *Theog.* 626). The origin of human life, like the abode of the dead is shrouded in darkness.

Diodorus Siculus 1.7.7, and Anaxagoras DK59 A62.7 (= Eur. *Mel.* 484) also describe the beginnings of the first life as a coming into the light: εἰς φάος.

In Latin the phrase is first found in Ennius, of the creative power of Romulus as father of the Roman race (see Skutsch, 1968, 131 ff.), *Ann.* 114: 'tu produxisti nos *intra luminis oras*', and *Ann.* 131: 'at sese sum quae dederat *in luminis oras*'. It is used by Vergil (also of the birth of trees) *G.* 2.47: 'se *tollent in luminis oras*', and a similar phrase at *A.* 7.660 'furtivum partu sub luminis edidit oras'. Vergil also uses a similar image for the creation of the first life in *G.* 2.340–1:

> cum *primae lucem pecudes hausere*, virumque
> terrea progenies duris caput extulit arvis

Other uses of this phrase as birth as a movement from dark to light are given by Arnobius, *Adv. Nat.* 2.69 'antequam Tages Tuscus *oras contingeret luminis*' where the autochthonous Tages appears from the ground, and Iuvenc. 4.761 of the *resurrection* of Christ: 'dicite Christum *remeasse in luminis oras*' (*TLL* 9.2.868.17 ff.).

782. incertis . . . ventis: *incertus* is often used of winds and weather (*TLL* 7.882.44 ff.): here, much as in Verg. *A.* 11.560 'dubiis committitur auris'. At 819 L. stresses the kindliness of the weather in the youth of the world, and in 820 explains 'omnia enim pariter crescunt et robora sumunt' (see below). Here the winds are more changeable than we should expect in the spring of the world. Perhaps some of the effects of the storm of elements in the creation of the world still remain (1.759–62 and 5.436–42, see on 820 below), or the point of view is that of the *arva* as anxious parents entrusting their offspring to an uncertain world.

crerint: as often, L. slips into teleological language. At 5.419–21 intelligent design is explicitly denied for the atoms in the creation of the world. However, the danger of a misreading of this as the Earth-Mother consciously deciding to produce life, rather than as a metaphor, would aid rather than detract from L.'s argument by analogy of the spontaneous generation of life from the earth, no matter how far it would be from Epicurean physics. L. taps into and uses teleological language to aid his anti-teleological message in two ways: firstly, we expect such language from teleological accounts of creation, and so L. uses their authority to undermine their own message, and secondly, it is much easier, human nature demanding simple explanations, to put a random process of undirected creation in terms of a decision of a personified creative entity. The technique is familiar, even today in anti-teleological evolutionary biology (compare Dawkins' 'selfish genes' and Darwin's 'natural selection', see below on 837 ff., Kennedy, 2002, 70–2). The method adopted in 1.44–9, after the creation ecphrasis in the Venus proem, and 2.644–60 after the ecphrasis of the *Magna Mater*, both of whom are alternative personifications of *natura* along with the Earth-Mother (see Fowler, 1996, and below on 811), is to remind the reader that the allegorization is not literally true, but here in book five we are not given a specific refutation. For the Earth-Mother see below on 795.

§2 Lines 783–836: The Creation of Life

Lines 783–787: the creation of plants

There are fewer ancient explanations extant for the origins of plant life than for animal life, even though the two should be equally difficult to account for. L. does not explain the original spontaneous generation of plants beyond using the diachronic analogy in 788 ff. with the growth of fur and feathers on young animals, whereas the original spontaneous generation of animals is proved by appeal to spontaneous generation of small creatures in the present day (797 ff.). Anaxagoras DK59 A117 (Theophr. *Hist. Plant.* 3.1.4) is reported to have explained plant origins with his theory that 'air contains the seeds of all things, and that these seeds, when carried down with the rain, produce plants'. Irenaeus (2.14.2) reports that Anaxagoras (DK59 A113) also accounted for the origins of animals with the same theory. Aëtius 5.26.4 (DK31 A70) reports that Empedocles accounted for the origin of trees by appealing to the warmth of the new earth, as L. does with animals, and described plants as 'parts of the earth, like the embryo which is part of the womb in the stomach' (see on 788 ff.).

From Aristotle's criticism of Empedocles' theory of the adaptation of animals that the mismatching of disparate limbs should also apply to plants, producing ludicrous combinations (*Physics* 199^b10–13), it has been inferred that Empedocles did not account for plant species origins by the same method as for animals (Wright, 1995, 51), and that he may have treated them in much the same way as L. does, as simply appearing in their present-day species with no plant monstrosities. However, the new Strasbourg fr. a(ii) 24–8 M&P suggests the same scheme accounted for both plants and animals, cf. Empedocles DK31 B20, Aëtius 5.19.5 and 5.26.4, *DRN* 2.1081–3, and see further on 837 ff. and 864 ff. below. However, it may well be that Empedocles used only humans and animals to *illustrate* his theory of adaptation, leaving the reader to infer that the same mechanism would account for both animals and plants, and simply described plants as arising fully formed from the ground.

The idea of the original spontaneous generation of plants is very similar to Golden Age myths of crops and trees arising spontaneously. Similarly, the youth of the world is analogous to spring time, and the sight of plants seemingly recreated spontaneously in spring would aid the concept of their original spontaneous generation (see Appendix B s.v. 'Food: Spontaneously Produced'), much as in Ov. *Met.* 1.107–9. In any case, the idea of plants appearing spontaneously from the earth would certainly seem more 'natural' than large animals doing the same, and would therefore need less justification.

783. principio genus herbarum: here we have the classic Lucretian didactic progression, appropriated by Vergil in *A.* 6.724–56, where Anchises lectures Aeneas on the nature of the universe: *principio* (724) . . . *inde* (728) . . . *hinc* (733) . . . *exinde* (743) . . . (see Austin ad loc.). Here in L. we have: *principio* (783) . . . *exinde* (786) . . . *inde loci* (791) . . . *hoc* (807). Compare 1.484 ff. *principio . . . praeterea . . . tum porro.*

L., as often, blends the temporal progression with the logical progression of the argument, as Vergil does, and here *principio* means 'in the beginning', and 'first (in the argument)' and also 'grasses were born first' (cf. 5.81, see Fowler, 2000*d*, 206–8).

Our expectations of the order of creation are informed by Genesis 1: 11–27—plants, then sea-creatures and birds, then land-animals, then humans. But having plants appear before animals does seem to be standard in Greek thinking as well. According to Aëtius 5.26.4 (DK31 A70) Empedocles begins his account of the creation of life with trees: 'trees were the first living things produced from the earth'. Diodorus Siculus 1.7.7 also starts with trees, quoting Euripides' *Melanippe* (fr. 484N) to show Euripides was a follower of Anaxagoras (DK59 A62), and so we may infer that Anaxagoras had the same order. Porphyry (*Life of Pythagoras* 44, DK58 C6) reports that Pythagoras had 'animals being born and plants growing up at the same time', but the authenticity of the report is doubtful (Blundell, 1986, 34–5; Burkert, 1972, 97 ff.).

The spring-time analogy would also favour the creation of plants first, since one of the first signs of spring is the sight of plants appearing from the soil, and of course, having plants arising first does give the animals something to eat as soon as they appear. The grasses help to make the fields *mollia* (780–1), and provide the *pueri* with soft bedding (816–17). It may not be fundamentally important to L.'s argument that grasses appeared before trees, but it suits two of his analogies that it is presented so: firstly the softness of the young world chimes in with the analogy of the nurturing of the first animals by the Earth-Mother, and secondly it fits the analogy of plants appearing as do the first feathers, fur, and bristles on the bodies of birds and mammals, where as is observable in nature, the softer down and fur appears before tougher feathers and bristles (see on 788–9). We now know that grasses were by no means the earliest of plants, and evolved only *c.*50 million years ago.

783–5. viridemque nitorem | . . . florida fulserunt viridanti prata colore: The brightness of the grass and flowers is that of spring, as in 5.1395–6: 'anni | tempora pingebant virdantis floribus herbas'; Ov. *Fasti* 4.126: 'vere *nitent* terrae'; Apul. *Met.* 10.29: 'quod ver in ipso ortu iam gemmulis floridis cuncta depingeret et iam *purpureo nitore prata vestiret*'; Hor. *Odes* 1.4.9–10: 'nunc decet aut *viridi nitidum caput inpedire myrto* | aut flore, terrae quem ferunt solutae'; *Pervigilium Veneris* 13: 'ipsa gemmis purpurantem pingit annum floridis' (cf. Pind. *Pyth.* 4.114; Mel. *Anth. Pal.* 9.363.2; Verg. *Ecl.* 9.49, *Culex* 70–1; Columella *Rust.* 10.256–7). As stressed again in 785, the brightness of the young world was greater than today. In 2.1157–74 the youthful fruitfulness of the world is compared with its now enfeebled state, and *nitidas fruges* 2.1157 is used of the first crops of the earth.

Flowers are emblematic of spring, the season of creation given at 5.802, and of the influence of Venus, as in 1.7–8: 'tibi suavis daedala tellus | summittit flores', and thus emblematic of sex, procreation, and birth. Flowers are linked closely with Venus and spring at 5.737–40, and this passage is one of the sources for Botticelli's *Allegoria della Primavera*, the Lucretian influence also being filtered through Ovid, e.g. *Met.* 1.107 ff., and later the *Pervigilium Veneris*. The season of the Creation was standardly spring, see Philo *Quaest. et Solut. in* Exodum 1.1; Verg. *G.* 2.324–42; *Pervigilium Veneris* 2: 'vere natus orbis est' (see Mynors, 1990, 140–2; Thomas, 1988, 215–19; Clementi on *Pervigilium Veneris* 2; and Farrel, 1991, 94–104). The link between spring and Venus as creatrix was strong in the ancient world (see Schilling, 1954; Clementi, 1936, 203 ff.). Calp. *Ecl.* 5.21–2 links flowers, spring, the rebirth of the world, Venus and sex, cf. Columella *Rust.* 10.196–9; *Pervigilium Veneris passim* e.g. 13–19; Apul. *Met.* 10.29; Marullus' Lucretian *Hymn to Venus* 34–5. Ancient etymologies derive *Aprilis* either from the creative power of Aphrodite, or from the opening of flowers in spring (Maltby, 44). Both etymologies have a sexual connotation, and link spring with Venus and creation, cf. Empedocles DK31 B66 *σχιστοὺς λειμῶνας . . . Ἀφροδίτης* of female genitalia (see Varro *LL* 6.33; Ov. *Fasti* 4.125 ff.; Schilling, 1954, 176–84, 389–95 for the *Veneralia* on 1 April; Frazer, 1929, 180–1, 190 ff.; Herbert-Brown, 1994, 81–95).

784. terra dedit: the explanation of the appearance of plant life is blunt and immediately shuts out any hint of divine involvement. The first plants were produced from the earth spontaneously. Compare Ov. *Met.* 1.102: 'per se dabat omnia tellus', and see table of themes in the Golden Age (Appendix B).

circum collis camposque per omnis: see 5.492–4 for the creation of plains and mountains. *Collis* and *campus* are very frequently yoked together in this way (e.g. 4.389 and 5.1373; Rhet. *Her.* 4.18.25; Cic. *Ver.* 4.47; Caes. *Bell. Afr.* 40.5, 68.2; Sall. *Iug.* 50.6; *TLL* 3.1626.65 ff.), and so we should read 'the earth spread the grasses about the hills and over all the plains: the flowery meadows shone'. *Prata* has an idea of luxuriant grassiness built into it (see below).

The grass is pictured surrounding the hills and then stretching over all the plains in a spreading process. A highly Lucretian picture is given by C. S. Lewis in *The Magician's Nephew*, 'The Founding of Narnia', turning L.'s imagery against him in an ecphrasis of a divine creation:

> The Lion was pacing to and fro about that empty land and singing his new song . . . and as he walked and sang the valley grew green with grass. It spread out from the Lion like a pool. It ran up the sides of the little hills like a wave. In a few minutes it was creeping up the lower slopes of the distant mountains, making that young world ever softer. (Lewis, 1955, 97)

785. prata: according to Varro *LL* 5.40: 'prata dicta ab eo, quod sine opere *parata*', and *RR* 1.7.10 'Antiqui prata *parata* appellarunt' (= Pliny *NH* 18.19), thus also Columella 2.16.2, and Isid. *Orig.* 15.13.17 (Maltby, 494). This etymology gives the word *prata* a gloss of antiquity useful in the context, and further, in the context of Epicurean ethics it may be important that *paratus* = *εὐπόριστος* 'easily obtainable' as in Epicurus *KΔ* 15, and 21. L. makes this use clear at 6.9–10: 'nam cum vidit hic ad victum quae flagitat usus | omnia iam ferme mortalibus esse *parata*'. The easy obtainability of the necessities for the satisfaction of physical needs and of peace of mind is a key point in Epicurean ethics (see L&S i. 121–5). Here the lack of effort implicit in *prata* prefigures the life of early humans in 937–8, where the earth produces all things spontaneously without human effort as in the Golden Age. (See Appendix B s.v. 'Food: Spontaneously Produced'.)

786. arboribusque . . . variis exinde: now trees follow the grasses in a second stage of birth. The order of appearance suggests an unspoken analogy with the order of their appearance in nature, where grass will colonize open ground, followed by woody plants and trees. This order would seem more 'natural' than grasses and trees appearing together. In Genesis 1: 11–12, grasses and trees are created together, but grasses are described first. As in Genesis, the trees are formed already in all their varieties (see on 801).

787. magnum immissis certamen habenis: *immissis habenis* is perhaps an Ennianism (e.g. *Ann.* 484). The metaphor is also found in Greek (e.g. Opp. *Hal.* 1.229, and 1.351; Nic. *Alex.* 16; Greg. Naz. *Carmina de se ipso* 1364.9,; Nicephorus Gregoras *Historia Romana* 1.551.9), and seems to be originally from horse racing, with the eager horse having been reined back being suddenly allowed to surge forward, as in Prop. 3.1.13, and Valerius Flaccus *Arg.* 5.586. It is often transferred to seafaring, of the ship given her head running fast before the wind with the sheets slackened off, e.g. Verg. *A.* 6.1, Valerius Flaccus *Arg.* 1.687 and 8.139 (for the seafaring terminology see Casson, 1986, 229 ff.), and is also used elsewhere of allowing trees to grow, e.g. Verg. *G.* 2.363; Varro *RR* 1.31.3 (see *TLL* 7.471.30 ff.; West, 1969, 55; Masson, 1907, 161). *Magnum . . . certamen* reminds us of the original racing context of the metaphor, and this, along with *datumst*, suggests the trees have an urge of their own to grow, and so stresses the spontaneous nature of the birth of the first plants. This agrees with Hippocratic thinking, in which children leave the womb by their own efforts, rather than being forced out by the mother's contractions (Hippoc. *Epid.* 5.103, and *Mul.* 1.68; Dean-Jones, 1996, 211–13, and see on 5.810 below. Note, however, that 5.224–5 do suggest the mother's contractions forcibly eject the child). There are perhaps also sexual overtones aided by the racing context and the loose sexual morality surrounding it, as in Ovid's similar phrase *loris . . . solutis* of the sexual freedom of his lustful wandering *flâneur* (*Ars Am.* 1.41). If we were to view the competition as an elimination contest, the metaphor would prefigure L.'s scheme of adaptation by competition in a struggle for life, and we could see the same mechanism operating for the origin of plant species (see on 854 below).

Lines 788–791

788–91. ut pluma . . . sustulit: the analogy is with the spontaneous nature of the growth of fur and feathers on young birds and animals: we see fur and feathers grow spontaneously on animals and birds, and so it is not surprising if the young earth produced plants as a similar spontaneous covering. The earth is producing plants for the first time as fur and feathers are produced for the first time from bare skin.

Further, if we place a comma after *sustulit*, we get the reading: 'as fur and feathers grow naturally on birds and animals thus the earth produced grasses first, and then created animals'. West sees the analogy as an 'argument in favour of the order L. is proposing. Plants and trees come first, then animals, just as birds sprout feathers first (and then develop their other functions)' (West, 1964, 100; cf. Munro, Bailey, and Costa ad loc.). If, however, we place a full stop rather than a comma after *sustulit* (as urged upon me by David Sedley), then the range of the analogy is limited: 'as fur and feathers grow naturally on birds and animals thus the earth originally produced grasses. Next she created animals . . .'. It seems, however, problematic to insist on a sense-unit stopping after the first foot of a Lucretian hexameter, and so I prefer the former reading, while allowing that both may be present.

Aristotle (*Mete.* 387^b4) notes the analogous nature of hair, feathers, and leaves, and quotes Empedocles DK31 B82, which may influence L. here:

> *ταὐτὰ τρίχες καὶ φύλλα καὶ οἰωνῶν πτερὰ πυκνά*
> *καὶ λεπίδες γίγνονται ἐπὶ στιβαροῖσι μέλεσσιν.*

As the same things, hair, leaves, the close-packed feathers of birds, and scales on strong limbs grow.

Wright notes (on B82): ‘The fragment supports Aristotle’s brief comment on bones, hair and the like being analogous: it is recalled in *Hist. An.* 487^{b}20 and imitated in Lucretius 5.788 . . . This serves to break down the barriers between plant, bird, animal, and human life’ (see also Bollack, 1969, 396–9). In DK31 A70, Empedocles is reported to explain the original growth of trees as ‘parts of the earth, like the embryo which is part of the womb in the stomach’, and so uses a similar biological analogy to account for the origin of plants: they are part of the earth as the embryo is part of the womb. For L. plants are part of the new earth as fur and feathers are part of animals and birds.

789. quadrupedum . . . pennipotentum: the animals and birds are introduced for the analogy, but pre-empt their creation in 791–2. According to West’s analysis (see above), the order of creation of animals after plants is analogous to the order of the development of their attributes. Thus, the use of *quadrupedum* and *pennipotentum* for animals and birds would be pointed: the attributes that will develop are fleetness of foot and the ability to fly.

Pennipotentum is seemingly a Lucretian coinage and found nowhere else except 2.878: *corpora pennipotentum*. It has an Ennian feel, cf. *Ann.* 191: ‘bellipotentes sunt magi’ quam sapientipotentes’, but perhaps is influenced by Empedocles’ ‘wing-sped gulls’, DK31 B20.7 (= Strasbourg fr. c 8 M&P): *πτεροβάμοσι κύμβαις*, or another lost Empedoclean phrase (cf. *τὰ πτητικά* Arist. *Hist. An.* 504^{b}8 ‘strong fliers’ LSJ). Empedocles is very fond of compound adjectives (e.g. DK31 B20.6–7, B21.11–12, B40, B60–1, B76.1–2, Strasbourg fr. a(ii) 26–8 with M&P ad loc.), and the compounds *quadrupedum* and *pennipotentum* certainly also have an Empedoclean feel to them, especially paired in the same line. L. is also fond of compounds (Bailey, 1947, 132–4), but unlike Ennius’ usage (e.g. *Ann.* 181) is cautious about pairing them in the same line, consecutive lines, or even two lines apart, and the only other phrases in which he does so probably originate in Empedocles (1.3, 2.1081–3, and 5.864–6, see below on 864–6, and Sedley, 1998, 24–5).

790. virgultaque: a good word for the analogy between the youth of the world and spring, since, according to Varro *LL* 6.9: 'tempus secundum *ver*, quod tum *virere virgulta*', and 5.102: '*virgultum* dicitur a *viridi*' (Maltby, 648, see on 785 and 802).

790–1. primum | . . . inde loci: the sequence is parallel to that begun by *primum* in 788 (which is not followed by *inde loci* for the reasons explained in note there). *Inde loci* appears also at 5.443 and 5.741, and is another Ennianism, as at *Ann.* fr. 22 and *Sat.* fr. 4, also used by Cicero, *Arat.* 327.

Lines 791–792: the creation of animals and humans

791–2. mortalia saecla . . . varia ratione coorta: clearly, in 805 *mortalia saecla* encompasses humans, but because of the seeming progression of the narrative of creation, L. *seems* to describe the birth of animals here. If this is so then L. uses the phrase in two different ways within a few lines. Before we are told of the origins of humans, we may interpret *mortalia saecla* as either both humans and animals, or animals alone. The phrase usually refers to humans alone (5.988, 5.1169, and 5.1238, cf. also *mortale genus* 1.1015). *Mortalis* is often used by L. for humans (e.g. 1.65, 1.151, 2.1158, 5.1092, 5.1101, 5.1165, 5.1280, 6.10, etc.), also in the phrases *mortalibus aegris* and *miseris mortalibus* (6.1, 5.944). More frequently L. uses *genus humanum* 1.727, 2.174, 2.342, 2.595, 2.975, 2.995, 3.1043, 5.71, 5.161, 5.822, 5.925, 5.1014, 5.1026, 5.1057, 5.1145, 5.1156, 5.1194, and 6.33. Also found is *humanum genus* 2.699, 4.594, 5.1306, and once *humana gens* 5.219. West (1964, 100) rightly interprets the passage as 783–5 plants, 786–7 trees, 788–92 plants and trees with animals and humans added, with everything after 793 a recapitulation of the Creation emphasizing the motherhood of the earth. Thus the narrative of creation stops at 792 and the later descriptions are not part of the temporal sequence. So, *mortalia saecla* can mean the same in 791 and 805 without excluding any species.

Similar Greek phrases may also have this range of meanings. Euripides describing the order of creation uses γένος θνητῶν for humans (fr. 484.5–6N = Anaxagoras DK59 A62). Empedocles uses θνητῶν γένεσις for 'all living creatures' (DK31 B17.3), but uses θνητῶν both for humans alone (DK31 B3), and for all living creatures (B8).

Perhaps most importantly, in Empedocles' zoogony under Love, the earth pours forth 'countless types of living things' ἔθνεα μυρία θνητῶν (B35.7 and 16), which are 'a wonder to behold' θαῦμα ἰδέσθαι (B35.17). These clearly are the same creatures whose strange genesis is described in frs. B57, 59, and 61, where separated limbs come together in multiform combinations, some producing the 'man-headed ox creatures'. This indicates that the birth of both humans and animals is covered by ἔθνεα θνητῶν. This lends weight to the view that both humans and animals are described here by *mortalia saecla* in 791. This has the advantage of avoiding separate births for humans and animals, and it is much more suitable to an Epicurean argument that no strong distinction is made between them (Schrijvers, 1974*a*, 246–7), since a clear division between them is often associated with a teleological view of the world (Blundell, 1986, 75, see on 792 below). Further 5.822–3 strongly suggests that all animals, including humans, are born at or about the same time (see below), the standard Presocratic and Atomist view, cf. Anaximander DK12 A30; Empedocles DK31 B71; Xenophanes DK21 B27, B29, B33; Archelaus DK60 A4; Anaxagoras DK59 A1; Pythagoras DK 58 C6; Democritus DK68 A139; Epicurus fr. 333 Us. (Censorinus *De Die Nat.* 4.9); and Diod. Sic. 1.7. Humans are in fact a species of animal (see Blundell, 1986, 79 ff., and Appendix A s.v. 'Humans are Animals'). Marullus, following this passage of L., describes at least birds and mammals arising at the same time in his *Hymn to Venus* (*Natural Hymns* 2.7.33–44; see Perosa, 1951, 129–33, 163–5; Harrauer, 1994, 354–7, 422–39). The construction of the passage, then, has the advantage of seeming to fit a teleological order of hierarchical creation while actually describing humans and animals being born at the same time (cf. e.g. Genesis 1: 11 ff.; Pl. *Tim.* 42b ff., 91a ff.; Ov. *Met.* 1.73 ff.; see Pelikan, 1997, 19–20, who sees a hierarchical order here).

792. multa modis multis varia ratione coorta: Verg. *A.* 6.738, in Anchises' Lucretian-style exposition of the creation and nature of the universe, uses a similar phrase of the bodily contamination of the soul: 'multa diu concreta modis inolescere miris' (see Austin ad loc.). He reinstates the epithet *miris* with *modis*, which L. had replaced by *multis*, and thus reappropriates the phrase *modis miris* for its former context: that of spirits, ghosts, visions, and other *inexplicable* things (as in Plaut. *Merc.* 225, *Mil.* 539, *Rud.* 593; cf. *DRN* 1.123 (perhaps quoting Ennius on the spirits in Acheron); Verg. *A.* 1.354, 7.89, 10.822, *G.* 1.477, 4.309). Vergil appropriates Lucretian language and uses it to give authority to his blending of Stoic, Orphic, and Pythagorean cosmology, replacing L.'s multiplicity of methods of creation with the Stoic single creative universal principle: the divine fire, and reintroducing the wonder that L. seeks to remove (see below on 799). He uses the same phrase to reintroduce wonder into spontaneous generation at *G.* 4.309 (of bees): *visenda modis animalia miris*. L. is perhaps influenced here by Empedocles DK31 B35. As Love gained the upper hand over Strife, the elements began to be blended and χεῖτ' ἔθνεα μυρία θνητῶν | παντοίαις ἰδέῃσιν ἀρηρότα, θαῦμα ἰδέσθαι, 'countless types of living creatures poured forth, fitted with all kinds of forms, a wonder to behold' (B35.16–17), but L. implicitly corrects Empedocles by removing the idea of wonder (see below on 899).

The stress on the multiplicity of methods of generation and plenitude of types of creatures underlines this randomness of creation, and serves, in particular, to argue against Plato *Tim.* 39e ff., and 90e ff., where the entire variety of animal life is derived from an original *singularity* of form: the human being. More generally, this explanation of the chance formation of life serves to argue against a broad range of teleological arguments on the creation of animals and humans. Chief amongst the teleologists and providentialists of L.'s day were the Stoics (see e.g. Sen. *Ep. Moral.* 121.5–6; Cic. *ND* 2.120 ff. with Pease ad loc.; Plut. *On Stoic Self-contradictions* 1044 D (= *SVF* 2.1163); Porph. *De Abst.* 3.20.1 (= *SVF* 2.1152 part); L&S ch. 54). We may reasonably interpret any anti-teleological argument that may seem to be aimed against Plato, as also anti-Stoic, since the recontextualization of an anti-Platonic argument of Epicurus in first-century Italy would inevitably be seen as an anti-Stoic argument (see Fowler, 2000*b*, 113 and 140 ff.; and Kleve, 1978; and against this view Furley, 1966; Sedley, 1998, 73–82).

Lines 793–796: Mother-Earth: rival theories discounted

We are given a choice of three places of origin for life: the sky, the sea, or the earth, in a traditional tripartite division of the world (see Hardie, 1986, 293–5, 313 ff.). The tripartite division serves to rebut the two main alternative theories of the origins of life: a heavenly creation, and Anaximander's (DK12 A30) alternative to the more traditional Presocratic and mythological idea of earth-origins: that life originally arose in water. The first two are *adunata*, leaving only the earth. (For the traditions and history of the earth-born, sky-born, and water-born theories see esp. Guthrie, 1957, 11 ff.)

L. uses similar arguments at 2.1153–6, and at 1.159–64, where in the proof of the existence of his indestructible primary particles he appropriates the Parmenidean tenet: if anything could come from nothing we would be faced with the same *adunata*, amongst others. As Bailey notes, the idea of the golden rope letting down animals from heaven in 2.1153–6 derives from *Iliad* 8.19 'where the gods propose to haul down Zeus from heaven to earth' with it. The Stoics are said to have interpreted the passage as an allegory of the heavenly origins of life (Them. *Orat.* 32p 363d, and Lévêque, 1959. Against this see Schrijvers, 1999, 4 n. 11), and, by the association between this passage and 2.1153–6, the rejection of the possibility of a heavenly origin of life will have an anti-Stoic feel about it. Costa ad loc. speaks of a 'jeering overstatement of the Stoic theory of the *pneuma*', the 'fiery breath', which pervades and animates all life (see L&S chs. 46–7). Certainly, L. does misrepresent the Stoic theory, especially as they also are reported to have had an idea of the origin of life from the earth (Censorinus *De Die Nat.* 4.10). However, the later Stoic tendency to allegorize, and to accept anthropomorphic gods as personifications of aspects of divinity, and especially the personification of the *pneuma* as Zeus, tends to invite such misrepresentation (see esp. Cleanthes' *Hymn to Zeus* (*SVF* 1.537) and Cic. *ND* 2.60 ff., with L&S i. 323 ff. Against Stoic allegorizing see Cic. *ND* 1.36 ff., and Cicero's source, Phld. *De Piet.* pt. 2, cols. 123 ff. Obbink = P. Herc. 1428 cols. 1 ff. Henrichs, 1974).

The argument is not solely against the Stoics, however, but is a sort of catch-all polemic, which will argue against any theory of a heavenly creation. Chief amongst these of course will be Plato's

Timaeus (e.g. 41 ff.) where a divine craftsman creates the world and all life in it. The closeness of this to the Stoic idea of the *pneuma* as a divine craftsman is clear (L&S i. 277 ff.), and this makes it impossible to separate out the two as individual targets for attack. Further, other philosophers seem to have had ideas of the origins of life from the sky (e.g. Anaxagoras DK59 A117, Epimenides DK3 B2), and they would also be caught in L.'s polemics. Of course, this opposition of sky-born to earth-born does not prevent L. from making use of the idea of the *hieros gamos* of earth and sky in his cosmogony (see below on 798–800).

That the controversy over water-born and sky-born origins of life is still very much alive is shown by the recent theory that life originally formed in the upper atmosphere from radiation acting upon sea-water aerosol droplets (see *New Scientist* 15 July 2000).

794. **nec terrestria de salsis exisse lacunis:** the *salsae . . . lacunae* are clearly the sea at 3.1031. The argument is based on the assumption, very common in ancient science (but of course quite different from the myths of transformation appropriated by Plato in *Timaeus* and found in Ovid's *Metamorphoses*, see Introduction and Campbell, 2000), that species are fixed, and cannot mutate into one another: land animals cannot have been born in the sea, they would have drowned (Schrijvers, 1999, 4 ff.). No species has mutated to become another different species, and all species keep their distinctive identities permanently, as L. states firmly in 5.923–4. The principles that keep species distinct are the *foedera naturae* (cf. 1.586, 2.302, 5.310, and 5.924) and the, seemingly identical, *alte terminus haerens* (cf. 1.77, 1.596, 2.1087, 5.90, and 6.66). The mechanism of the *foedera naturae* derives from the fact that there is a limited number of possible atomic shapes. This causes there to be a limited variety of possible atomic combinations. As not every atom can join with any other atom, the possible varieties of matter, and of animals, are limited. Each animal has a distinctive atomic genetic make-up, which prevents it turning into another sort of animal, and this is passed on to offspring whose ontological stability is thus preserved (see *Ep. Hdt.* 42–3; *DRN* 2.478–531, 2.700–29, 5.440–2; Blundell, 1986, 92–3; Long, 1977, 63–88). So L., very often regarded as an Evolutionist, is actually an anti-Evolutionist. There would seem to be little

hint that any ancient scientist, apart from Plato in *Timaeus*, accounted for the origin of species by a process of evolutionary mutation from one species to another (see on 837 ff. below).

The argument that life originally arose in water is reminiscent of the Oparin–Haldane theory of the origins of life in pre-biotic oceans (see below on 797 ff.).

795–6. The analogy between the earth and a mother is of course extremely common throughout ancient thinking, and can be found in both mythological and philosophical contexts (see Dubois, 1988, 39 ff.). The similarity of the phrasing to the *Magna Mater* passage in 2.586–660 suggests strongly that the same view of the earth as mother is taken here. There the idea of the motherhood of earth stems from her containing the seeds of all things, and here from her giving birth to all life. The *Magna Mater* is also interpreted allegorically by Varro (in August. *Civ. Dei* 7.24 b–c), and the Stoic Cornutus *Theol. Gr.* 6. L. makes it clear that such allegorizing is acceptable only so long as it is remembered the earth is not actually a god (2.652–60). It is, as with his use of teleological language, a useful heuristic and didactic technique, but the reader is reminded by *e terra quoniam sunt cuncta creata* that the truth of it is limited, and has a mechanistic basis. Compare Cic. *ND* 2.63 ff. with Pease ad loc. for the Stoic view of *Terra* as an actual god suffused by the *anima mundi*.

L. does not quite call the earth a mother: she has rightly gained the name of mother. There would seem to be an appeal here to the popularity or universality of this idea for its (here, limited) veracity, and this is similar to the proof of the existence of the gods by the universality of their apprehension by humans (Epicurus *Ep. Men.* 123–4; *Ep. Hdt.* 76–7; *DRN* 5.1161–1225. See L&S i. 144–9; Clay, 1983, 229). Accordingly, L. is skating on thin theological ice here, and while the device may be rhetorically and didactically valuable, it is problematic in a philosophy that so fiercely condemns others, especially the Stoics, for such allegorizing (Phld. *De Piet.* pt. 2, cols. 123 ff. Obbink (forthcoming) = P. Herc. 1428 cols. 1 ff. Henrichs, 1974, see Obbink, 1995, 200 ff.). The function of the allegory in the surface logic of the poem is clear: the fact of the origin of life on earth, by spontaneous generation caused by the rearrangement of atoms by water under the influence of heat rather than by any exterior divine influence, is proved by the appeal to a popular belief in the motherhood of the earth. The greater difficulty lies in unravelling the poetic, emotional, and religious relationships of this allegory to Venus and the *Magna Mater*, L.'s use of myth generally and the religious status of the poem, and judging to what degree we are seeing an Epicurean allegory, or L.'s appropriation of the allegory. Philip Hardie (1986, 11) speaks of

> Lucretius' peculiar tactic of getting inside his opponents' positions and then evacuating them of their prior content to refill them with Epicurean doctrine; the emotional and aesthetic appeal of a Cleanthes is parasitically diverted to the ends of an areligious materialism.

The ubiquity of this allegory of Mother-Earth prevents a neat analysis of sources and targets, and here L. can hardly 'evacuate the prior contents' of the allegory, but rather, uses them entire as part of his anti-teleological mechanistic argument. Inevitably, the recontextualization of opponents' positions will radically alter their meaning, but some of the previous accretions of meaning will still always adhere to them in the new context. Here the accretions of religious meaning lend weight and authority to the idea, without seriously damaging the anti-teleological argument. See further on the *hieros gamos* below on 799–800, and Fowler, 2000*b*, 143 ff. There is an extensive bibliography on this passage. See Gale, 1994, 27–32; Duban, 1982; Catto, 1988–9; West, 1969, 103–14; Schrijvers, 1999, 4 ff. For supposed Stoic influences in the allegory see Boyancé, 1941, and 1963, 123. For the relationship between *Terra-Mater—Magna Mater—Venus* and *natura* see Fowler, 1996; Clay, 1983, ch. 3, esp. pp. 85, 93 ff., 166, and 227–9; Segal, 1990, 196–207.

Lines 797–800: the spontaneous generation of the first animal life

C. S. Lewis illustrates such a scene of autochthonous birth in *The Magician's Nephew*, ch. 9 'The Founding of Narnia':

> Can you imagine a stretch of grassy land bubbling like water in a pot? For that is the best description of what was happening. In all directions it was swelling into humps. They were of very different sizes, some no bigger than mole hills, some as big as wheel-barrows, two the size of cottages. And the humps moved and swelled until they burst, and the

> crumbled earth poured out of them, and from each hump there came out an animal . . .

The frontispiece by M. Burghers to Creech's translation of L. (5th edn., 1700) also depicts the scene, showing a snake, a human, a tiger, an elephant, and even a unicorn and an 'Empedoclean' man-faced sheep-creature arising from the ground (see further below on 837 ff., 878 ff.).

The original spontaneous generation of life from the earth was a very common belief in the ancient world, as was the idea that life could still generate spontaneously in the present (Appendix A; Blundell, 1986, 62–7). L. refers to spontaneous generation in four other places in *DRN*: 2.871–3, 2.898–901, 2.926–9, and 3.719–21.

There was some disagreement, however, and Philo (*De Aeternitate Mundi* 55 ff.) reports the Peripatetic Critolaus on the impossibility of original human spontaneous generation.

We are not given an Atomistic explanation for spontaneous generation here, as we are at 2.865 ff., and this is characteristic of the zoogony as a whole. L. avoids Atomism and relies upon the comfortably acceptable ideas of the background tradition (see Introduction).

The idea of present-day spontaneous generation was not finally exploded until the nineteenth century. Bailey ad loc. is wrong to describe this as a 'pathetic belief to which L. clings', and on 2.865 ff.:

> The argument is cruder than usual, and it is hardly necessary to point out that worms are not created by a readjustment of the particles of earth; they appear after rain if they were there before.

Schrijvers (1974*a*, 251) notes:

> Ces observations nous semblent trahir un certain manque de perspective historique. Au fond, c'est depuis Pasteur qu'en définitive, un jugement pareil est devenu possible!

(See Pasteur, 1876; Oparin, 1968, ch. 1; Farley, 1977.) However, Pasteur proved only that life does not spontaneously generate in the present day, and not that it did not generate spontaneously originally. The original spontaneous generation of life is still the cause of great argument between Creationists and Evolutionists, since Evolutionists must rely upon some sort of spontaneous abiogenesis to account for the origins of life. Pasteur is regarded as a hero by the Creationists, who see spontaneous generation as a specifically evolutionary theory. The beginnings of modern theories of the original spontaneous generation of life are in the Oparin–Haldane theory:

1. Organic molecules formed on the early earth accumulated in the oceans, which came to resemble warm, dilute soup.
2. Protocells and the earliest cells obtained energy by consuming this soup, i.e. they were heterotrophic (other-feeding) and fermented substances in the absence of oxygen (Skelton, 1993, 848).

The similarity to ancient ideas of the origin of life by spontaneous generation is clear; see Christian de Duve, 'The Beginnings of Life on Earth', *American Scientist*, Sept.–Oct. 1995. For more on ancient spontaneous generation see Waszinck, 1964, 49–56; Guthrie, 1957, chs. 1 and 2; Louis, 1968, 297–8; Schrijvers, 1974*a*, 250–5.

797. **nunc etiam:** the argument is by diachronic analogy with spontaneous generation in the present day. (See Schrijvers, 1974*a*, 250 n. 15; Spoerri, 1959, 117; Schiesaro, 1990, 103.)

exsistunt: used of the spontaneous generation of *worms* at 2.871 'vivos exsistere vermis', and often used of the appearance of *plants* from the soil, e.g. Varro *RR* 1.34 'quae a bruma sata sunt, quadragesimo die vix exsistunt', and also of human autochthony, e.g. Cic. *Rep.* 3.25 of the Athenians, *Div.* 2.50 of Tages (*TLL* 5.2.1869.15 ff., and 1872.4 ff.).

797–8. **terris | imbribus et calido solis concreta vapore:** earth (or rotting material), heat, and moisture are prerequisites for the spontaneous generation of life in nearly all ancient accounts (see Appendix A). As Blundell (1986, 48) says:

> By the late fifth century the theory was firmly established that the first human beings were born from the ground, that earth and water were the substances of which they were composed, and that heat was an agent in their manufacture . . . No other basic hypothesis, so far as we know, was ever put forward in scientific philosophy.

As in Plato's *Timaeus* 43a, earth, water, and fire give us three of the Empedoclean elements involved in the creation of life, air is perhaps provided by *aether* at 800, but if it is exactly parallel to the heat of the sun nowadays, we should expect it to be fiery. Empedocles, however, uses *aether* exclusively for 'air' (see e.g. DK31 B6, B17 with Strasbourg fr. a(ii) 21 M&P, and B71, and Wright's table of Empedoclean terms for the four 'roots', 1995, 23).

In the Mediterranean world, rain is the usual mechanism for the introduction of water for agriculture, and obviously a prerequisite for new life and growth. In Egypt, water comes from the flooding of the Nile, and so life is formed from the mud deposited as the flood recedes (Ov. *Met.* 1.422–3; Diod. Sic. 1.10.2). This allowed early Egyptian cosmologies to posit an Earth *Father*, Geb, and a Sky *Mother*, Nut, while rainfall naturally led to the concept of a Sky Father and Earth-Mother (Guthrie, 1957, 30, and Wright, 1996, 57). L. has rain as semen fertilizing the earth at 1.250–64, and 2.991–7. Compare *Pervigilium Veneris* 4, *maritis imbribus* (of spring); Vergil gives the same idea in his description of the arrival of the fruitful time of spring in very Lucretian language, *G.* 2.325–6:

> tum Pater Omnipotens fecundis imbribus Aether
> coniugis in gremium laetae descendit . . .

(See further on 800 below.)

calido solis . . . vapore: today the sun must provide the heat necessary for the spontaneous generation of life. In the beginning, this heat was provided either by the fiery *aether* as it was squeezed out of the earth, or by the sun, when the *aether* had risen up to form sun, moon, and stars (5.449 ff., 1.1032 ff., see below on 800).

In Epicureanism, the heat of the sun is not radiation, but a stream of very fast, very small particles of heat (2.150 ff., 4.185 ff.). Thus, the meanings of *vapor* 'hot vapour' and simply 'heat' coincide neatly here. L. mentions heat in connection with spontaneous generation here, 5.800, 5.806, and perhaps in 2.928 *effervere* (West, 1969, 16).

concreta: *concresco* is used by L. at 1.840 of the coming together of Anaxagoras' elements, at 4.1257 of the coming together of male and female seed in procreation, and of the coming together of the separate elements in the creation of the world and of life at 1.1019, 5.468, and 5.495. Thus, as is traditional (Furley, 1989, 229–33), the three processes of creation are viewed as essentially similar. The word is also used of the creation of life by Cicero *ND* 3.34; Censorinus *De Die Nat.* 4.7 (of Anaximander's theory DK12 A30); Lactant. *De Ira* 10.1 (*TLL* 4.96.51 ff.), and thus has a mechanistic feel. Empedocles describes animals as συναρμοσθέντα from the four elements by Aphrodite (DK31 71.4), and also describes the creation of animals as a 'coming together' σύνοδος (DK31 B17.4, and Strasbourg fr. a(ii) 24 and 30 M&P).

Lines 799–800: origins of life not amazing

The argument is a fortiori (West, 1964, 100), and the proof is of spontaneous generation in the beginning of the world by analogy with spontaneous generation in the present day. The problem is to prove that more and larger creatures (*plura* . . . | *et maiora*) were originally born by spontaneous generation.

799. **quo minus est mirum:** the didactic function of book five, as L. presents it at 5.55 ff., is to remove *wonder* (*mirantur* 5.83) at the sort of things that may lead to the attribution of temporal powers to the gods (see 5.83–4). Language is one of the things he must explain (5.71–2), along with the mortality of the world (5.64–6), its origin (5.67–9), the origin of species (5.69–70), the origin of religion (5.73–5), and especially astronomy (5.76–81, 84–5) (see below on 1028 ff.). We need not wonder at the earth's ability to produce large creatures spontaneously, and thus attribute the creation of animals to some divine agency: the process is the same as that by which she now produces small creatures. She was younger then and more vigorous, and so produced larger creatures than today. There is also possibly an implicit criticism of Empedocles, who describes the outpouring of creatures under the rule of Love as θαῦμα ἰδέσθαι 'a wonder to behold' (DK31 B35.17). However, Empedocles also admonishes Pausanias not to 'sit staring dazed' but to 'contemplate [Love] with the mind' (DK31 B17.21–2).

800. **nova tellure atque aethere:** the young earth's greater creative powers are explained mechanistically: the air and earth were new and so more vigorous. This argument is used the other way around at 826–36, where the Earth-Mother simile is used to prove the inability of the modern earth to produce such animals (see below).

Aether would seem to be either air or the fiery *aether* which rises above the air in the creation of the world at 5.495 ff., cf. 498 'inde mare, inde aer, inde aether ignifer ipse'. Thus, it could supply the fourth Empedoclean element for the creation of life (e.g. DK31 B71) along with earth, while water and heat are provided by *imbribus* and *calido solis vapore* 798 (but see above on 797–8). The fact that the last two are actually involved in the generation of life in the present day only serves to underline the closeness of the analogy between primordial and present-day spontaneous generation. On the other hand, *aethere* here could also refer to the fiery *aether* and its traditional role in creating life as it separates out from the just-formed earth. L. uses *aether* loosely: for the fiery element that makes up the stars (e.g. 1.231, 2.1098, 3.1044, 5.215), for the sky or heavens (e.g. 2.1000, 4.391, 5.398), for either air or sky (e.g. 3.784, 5.128, 5.143), or for simply 'air' (e.g. 2.1115, 4.911).

In the creation of the world, he describes the *aether ignifer* being squeezed out of the body of the earth to rise and form the sun and stars (5.449–91). It is not clear in L.'s account whether this process is complete by the time of the first appearance of life, and whether the extra heat is supplied by the remnants of the *aether* as it separates out, or by the sun, but it may be significant that Empedocles (DK31 B62) describes the 'whole-natured forms' being drawn up 'by night' from the earth by Fire as it separates from earth, presumably before the creation of the sun (cf. fr. d M&P). In 798, L. describes the spontaneous generation *nowadays* of animals, in which the sun supplies the necessary heat 'imbribus et calido solis concreta vapore'. The two things, fiery *aether* and the sun, are of course really the same in Presocratic and Atomist thinking (e.g. Empedocles DK31 B21.3–6 with Wright, 1995, 23; *DRN* 5.449 ff.), and the question really is at what point zoogony takes place: before or after the *aether* rises to form the sun. Anaxagoras DK59 A1 seems to have had a similar idea to Empedocles (Diog. Laert. 2.9), and Archelaus has heat and cold mixed 'in the lower region' producing life (DK60 A4). Diodorus Siculus, on the other hand, has the sun warming earth to produce the original life (1.7.3). In Genesis, the position is confused, with God creating light at 1: 3 ff. before the creation of life, but creating the sun, moon, and stars at 1: 14 ff. after the creation of life.

In the Earth-Mother context, the mention of *aether* and *terra* together as instrumental in the creation of life inevitably brings with it associations of the *hieros gamos* of *Pater Aether* and *Terra Mater* as the creators of life. The idea is a very ancient one, and we may presume derives from some of the earliest cosmological speculation. It is also given in L. at 1.250–64 and 2.991–1003, where there are close links with Anaxagoras DK59 A117 (Ps. Arist. *De Plant.* 2.817^{a}23); Eur. *Chrysippus* fr. 839 Nauck; Aesch. *Dan.* fr. 44 Radt. See especially Fowler, 2000*b*, 143 ff., who discusses the complex intertextual relationships between the Lucretian and dramatic passages. The idea became a commonplace, as Tertullian (*Apol.* 10) says: 'quis enim non caelum et terram matrem ac patrem venerationis et honoris gratia appellet?' See the Homeric *Hymn to Mother Earth* 13–16; Arist. *NE* 8.1.3–7; Verg. *G.* 2.324–5; Cic. *Sen.* 51; Plut. *Amat.* 20, 770 A–B; Men. Rhet. 400.29 ff.; Stat. *Silv.* 1.2.182–7; Claudianus *De Rapt. Pros.* 2.89; Solinus *Polyhistor.* 53.23; Claudius Marius Victor *Commentarii in Genesim* 2.129–31; *Pervigilium Veneris* 59 ff.

(For modern studies see Solmsen, 1953; Schiesaro, 1990, 111 ff.; Klinz, 1933; Pauly, s.v. 'Hieros Gamos'; Kranz, 1929; Alfonsi, 1968; Gale, 1994, 129 ff.; Fowler, 1996*a*, and 2000*a*; Catto, 1988–9; Giancotti, 1989; Nugent, 1994; Mynors on Verg. *G.* 2.323 ff.; Miles, 1980, 136 ff.; Farrell, 1991, 96 ff.; Clementi, 1936, on *Pervigilium Veneris* 59 ff.; Furley, 1989, 229 ff.)

adulta: used of growth to maturity at 2.1123, 2.1131, 3.449, and 4.1038 (*TLL* 1.802.56 ff.) and here seems to describe the maturing of the first life as well as its birth. The difficulty of the original spontaneous generation of almost any animals, except worms and insects, is the feeding and protection of the infant animals without parents (Critolaus (Philo *De Aet. Mund.* 55 ff.)). This is the reason behind Anaximander's idea of humans originally being protected inside fishes until puberty (see note to 794). L. avoids the problem with mammals, at least (see on 808 ff.), by the earth herself behaving just as a mother, feeding and protecting the infants who emerge from the wombs, and by the greater warmth and kindliness of the primeval climate. With birds the position is less clear. Birds cannot really take part in the Earth-Mother analogy of 808 ff. since they do not suckle. It could be that *adulta* suggests that creatures are described as being born at a later stage of maturity than nowadays, as are Anaximander's first humans (see below on 804). This would get around the difficulty and fit in with the analogy with the cicadas, which are born as adults (see on 801–4 below). Censorinus, paraphrasing this passage, uses *adultos* of the growth of the first humans in the wombs (*De Die Nat.* 4.9 = fr. 333 Us., see below on 807 ff.).

Lines 801–804: birds

801. principio: the force of *principio* is more doubtful here than at 783 (see above), where the three meanings do not contradict each other. Here it is not clear whether we return to 'in the beginning', in a recapitulation of the creation, or whether we are told that birds were born first. 825 *aeriasque simul volucres* strongly suggests that birds are born at the same time as humans and other animals. However, West (1964, 100–1) considers that here birds are described as preceding mammals to add a physiological argument for the motherhood of earth, i.e. the earth produced birds first since they were easier to produce, as shown by the analogy of their birth to that of cicadas. It is true that the birth of birds needs to be *described* before that of mammals to give the bridging idea of the eggs between the spontaneous generation of worms and the spontaneous generation of mammals (see below on 802 *ova*), but accepting West's own argument that the narrative of creation stops at 792, there would seem no great need to take *principio* as part of a relative chronology of creation. *Principio* could simply be '*originally* birds were born just as cicadas are nowadays'. Alternatively, as suggested by 1078 'postremo genus alituum variaeque volucres', *principio* here could be simply the first point in the argument.

Robin followed by Schrijvers (1974*a*, 253) and Bailey ad loc. consider that birds appear first since 'the period of gestation required for the eggs was shorter'. The separate creations of birds, animals, and humans would be expected in a teleological account of creation (see on 791 and 805), whereas for an anti-teleological account it is important that the same process can account for the generation of all animal and human life, and so it is desirable to avoid chronological separation of the creation of birds, animals, and humans. Compare Genesis 1: 20–6 where the hierarchy of nature is established by the order of appearance of living creatures, with humans, most important, last. Plato in *Timaeus* 90e ff. achieves human primacy in the hierarchy of nature by having humans created first, and then all animals created from them by a process of degradation, but in his scale birds are 'higher' than land animals, and he also describes the creation of birds before that of animals (91d ff.). Diodorus Siculus 1.7.4–5 (see Spoerri, 1959, and Blundell, 1986, 67–8), and Archelaus (DK60 A4.5–6) have all animals including humans appearing at the same time.

Further, since the birds are the first creatures to herald spring and feel the revivifying influence of Venus in 1.12–14: 'aeriae primum volucres . . . inde ferae pecudes', this would of course be a further reason to describe their birth before that of animals: in nature birds do herald spring and creation/re-creation. The association of birds, spring, and Venus/Aphrodite is traditional (cf. *Homeric Hymn to Aphrodite* 1–5), and runs through later Lucretian-influenced poetry, e.g. Verg. *G.* 2.318; Ov. *Met.* 13.673 ff., 14.597 ff.; Apul. *Met.* 11.7; *Pervigilium Veneris* 3; Marullus *Hymn to Venus* 68.

genus alituum variaeque volucres: see also below on 825 and 1078. L. is fond of both *alituum genus* and *variae volucres*: 1.589, 2.145, 2.344, 4.1007, 5.1039, 5.1078, 6.1216. Compare the later uses by Manilius *Astr.* 5.369: 'alituum genus in studium censusque vocabit'; Verg. *A.* 8.27 (= Sen. *Con.* 7.1.27.14): 'alituum pecudumque genus, sopor altus habebat'.

Although *variae volucres* is frequently used by L., here it helps to emphasize the great variety of forms of the first creatures, to emphasize the random nature of creation, and to show that the Epicurean theory of the origin of life could account for the variety of nature. This variety is stressed again at 5.825: 'aeriasque . . . volucres variantibus formis', and is stunningly illustrated by Piero di Cosimo in his Lucretian allegory of prehistory *The Forest Fire*, in which he exhibits an unusual variety of bird species, amongst other Lucretian animals and Empedoclean compound creatures (see Whistler and Bomford, 1999, 10–11).

For the Stoics the ποικιλία of nature was seen as proof of divine providence arranging the world for the delight of humans: the peacock was created for the sake of its tail, not vice versa (Plut.

De Stoicorum Repugnantiis 1044 D = *SVF* 2.1163, cf. Cic. *ND* 2.98 ff. with Pease ad loc.). A similar sentiment is expressed in the hymn 'All Things Bright and Beautiful' by Cecil Frances Humphreys Alexander, 1848.

In modern thinking the different plumage and forms of birds have played a crucial role in the development of theories of evolution. Most famously, Darwin's finches have been regarded as the starting point of his conversion to evolutionary ideas. Darwin's initial failure to realize the significance of the Galápagos finches stemmed from his misunderstanding the fact that, although they had very similar plumage, they all had very different beaks. As a Creationist at the time, Darwin assumed that variation in plumage would be a superficial character indicating only species difference, while variation in beak shape must be a fundamental structural difference indicative of the different genera of the Creator's overall plan. His later realization that the Galápagos finches are in fact all of the same genus forced a fundamental rethinking of his Creationist outlook. If fundamental features of form could vary so widely within genera, they could hardly be evidence of the Creator's plan (Gould, 1985, 347–59).

> Evolutionists see variation as fundamental, as the raw material of evolutionary change . . . Creationists believe that each species is endowed with a fixed essence. Variation is a mere nuisance, a confusing array of environmentally induced departures from an ideal form. (Gould, 1985, 353)

The Stoic view of variation in nature is similar to that of the modern Creationists: they would regard variation as having only a secondary function, while for L., as for modern Evolutionists, variation is primary, and arises from the lack of any direction or design in creation and adaptation of creatures.

802. The eggs are the counterpart of the *folliculos*. In Greek biology eggs were compared to chrysalises, both because of their outward similarities (cf. 803 *folliculos . . . teretes*) and for their similar functions in feeding the young enclosed (e.g. Arist. *Gen. An.* 758^{b}15–24, see Schrijvers, 1974*a*, 253). Intriguingly, Empedocles uses an analogy between eggs and olives, DK31 B79: *οὕτω δ' ὠιοτοκεῖ μακρὰ δένδρεα πρῶτον ἐλαίας*, 'in this way tall trees produce olive eggs first'. The original context of this is lost, but it would be a useful way of accounting for the birth of the first eggs. The analogy between eggs and chrysalises provides a bridge between L.'s standard example of spontaneous generation, the worms, appearing directly from the ground, and the more difficult idea of large mammals appearing from wombs rooted in the earth (see below on 808 ff.). This provides a reason unconnected with any relative chronology of creation of species, for birds being treated before mammals (see Waszinck, 1964, 51). Here the earth produces eggs from which birds then hatch, rather than the imaginatively more difficult idea of birds appearing directly from the ground (compare, however, Diod. Sic. 1.10.2 where mice appear fully formed directly from the soil of Egypt with no intermediate stage). This leaves only the difficulty of the egg coming before the bird, which is proven possible by the chrysalis coming before the cicada. L. compares the emergence of birds from eggs to the emergence of worms from the ground at 2.926–9, where both are used as examples of sentient beings arising from non-sentient matter.

relinquebant: the first birds behaved in a way analogous to cicadas today. The imperfect suggests a process of birth over time not mirrored elsewhere in the account except for *crescebant uteri* 808, which gives an idea of the gradual growth of the wombs. Compare the aorists *dedit* 784, *sustulit* 791, *creata [sunt]* 796, *coorta [sunt]* 799, *dedit* 805, *creavit* 822, *fudit* 823. The idea is perhaps of a succession of hatchings over a period, or season, as with the cicadas (803), or a description of the way in which birds do leave their eggs, gradually pecking their way out. Mammals are born more suddenly.

exclusae: in the context of eggs hatching, this verb is usually transitive, the subject a parent bird, the object a chick (Schrijvers, 1974*a*, 253; *TLL* 5.2.1272.16 ff.). Here, the spontaneous nature of the hatching is underlined by the chick taking on the role of its own parent (of course non-existent) and hatching itself (see below on *sponte sua* 804).

tempore verno: for the analogy between the youth of the world and spring see on 783–5 above. As the cicadas are born at midsummer nowadays when the weather is warm enough, so in the beginning of the world the greater warmth enabled birds to be born in the spring, as they are now, but without the protecting warmth of parents. In this way the integrity of seasonal birth is maintained and the analogy with cicadas is preserved. The problem of how an egg can hatch without a bird to sit it is avoided.

803. folliculos . . . teretes: the outward similarity of the cicada chrysalises to eggs is stressed. We have an analogy within an analogy: eggs and chrysalises are similar in appearance, and so similar in function. The similarity is discussed by Aristotle (*Gen. An.* $762^{b}28$–$763^{a}7$), who dismisses the possibility of original spontaneous generation from eggs since this is not observed in nature.

ut nunc: birds are no longer born by spontaneous generation because of the senescence of the earth, but the earth can still produce smaller creatures. The senescence of the earth is explained by Epicurean physics at 2.1105–74 (see below on 826–36).

aestate cicadae: Plato uses a similar analogy in *Symposium* 191C: 'at one time men sowed their seeds not in one another but in the ground like cicadas'. (See Loraux, 1993, 196–207.) Cf. 4.58 'cum teretes ponunt tunicas aestate cicadae'.

The spontaneous generation of cicadas was a widely held belief in antiquity (e.g. *Anacreonta* 34; Plut. *Mor.* 637 B; Sext. Emp. *Pyrrh.* 1.41; Beavis, 1988, 91 ff.). For the Athenians the cicada, τέττιξ, was a symbol of their autochthonous origins to such a degree that they wore golden cicada brooches in their hair (Thuc. 1.6; Aristoph. *Eq.* 1331, *Nub.* 984; Eustathius 395.33; see Beavis, 1988, 96–7). Further, since cicadas were popularly believed to generate spontaneously inside chrysalises rather than appearing directly from the ground, they could introduce an idea of an intermediate stage between spontaneous generation and sexual reproduction, and so help bridge the gap between the two (Guthrie, 1957, 114–15 n. 16). The true life cycle of the cicada was well understood in ancient science (Arist. *Hist. An.* 556.14 ff.; Pliny *NH* 11.93; Plut. *Mor.* 767 D): the female lays its eggs in vine or other plant stalks; the hatched nymphs burrow into the ground and feed on roots, and then the fully developed nymph emerges at night around the summer solstice. Its outer covering splits open; the cicada emerges and starts to sing.

This two-stage birth from the ground parallels that of the birds (eggs are produced spontaneously from the earth, and then birds hatch out) and that of the mammals (wombs appear spontaneously from the earth then mammals come out of them).

The association of the cicada with the heat of summer is also very strong (e.g. Ov. *Ars Am.* 1.271; Hes. *Sc.* 397; *Anacreonta* 34; Theophr. *De Sign.* 54; Alcaeus fr. 39B), and because they are such Theocritean animals they help bring in a pastoral feel (e.g. Theocr. *Id.* 5.29, 5.111, 7.159). They were considered the poets and scholars of the insect world, both for their devotion to the art of song and for their supposed ability to subsist on dew alone, or even thin air (Aristoph. *Nub.* 1360; Pl. *Phdr.* 259c).

804. The transition from the Earth-Mother actively producing life (cf. 782, 784) to the will of the animals themselves to be born is complete (although L. returns immediately to the previous idea in 805 *terra dedit*). The point is clear; the first birds were born spontaneously as are the cicadas nowadays. The change is simply one of the focus moving from the will of the earth to the will of the animals. The cicadas are seen in nature to hatch themselves and leave their chrysalises of their own accord and therefore the analogy demands the same of the birds, and proves that no parents were necessary for the hatching.

The process of birth is in two stages: eggs/chrysalises created spontaneously by the earth. Then birds/cicadas are born from them, also spontaneously. These two stages are mirrored in the birth of the mammals from wombs rooted in the earth (see on 808 ff.).

victum vitamque petentes: used at 5.1080, significantly in the context of the analogy between bird and cicada behaviour, of birds feeding in the sea (compare Enn. *Ann.* 145: 'mari quaesentibus vitam'). Cf. 810 'fugiens umorem aurasque petessens' of the birth of *humans* from the wombs in the earth. In Hippocratic thinking, the failure of the *food supply* to the embryo causes its struggles to be born and seek food (see Dean-Jones, 1996, 211–13; Hipp. *Epid.* 5.103, and *Mul.* 1.68).

Although this phrase strictly refers to the cicadas, some of its force will inevitably attach to the birds. The young cicadas have been nourished within their chrysalises (as have birds within eggs), now they must find their own food. The phrase is perhaps more apt for birds than for cicadas, since adult cicadas were popularly believed to subsist on dew alone (Verg. *Ecl* 5.77;

Guthrie, 1957, 114 n. 16). The parentless birds would have more difficulty, but, as *adulta* 800, and here *victum vitamque petentes* suggests, they are born at a late enough stage of development to find their own sustenance immediately they hatch.

Lines 805–806: the creation of humans and animals reprised

805. tum: here does not refer forward in time to the creation of mammals from wombs; i.e. '*it was at this time* that the earth first produced living creatures', rather than 'birds came out of eggs, and *then* the earth produced mammals'. Thus, the births of birds and mammals (including humans) are contemporaneous, and these lines reprise the outline description of spontaneous generation in 797–800 (West, 1964, 100–1; Schrijvers, 1999, 1–3). Line 806 follows in explanation of how the earth was able to produce living creatures at that time, 'at this time . . . *for* the earth was very hot and damp'.

tibi: placed second in the line *tibi* is an unstressed enclitic by Wackernagel's Law, with more the sense 'you see' than 'for *you*'. Further, Adams argues (1994) that such pronouns attach to the focus of an utterance as their host. Thus, *tum* here is stressed, underlining the point of time rather than the sequence. The appeal to the reader has a humanizing effect that underlines the fact that the *mortalia saecla* include humans. That these lines begin a reprise of the creation (West, 1964, 100–1) is indicated by the fact that L. uses *tibi* especially as a closural or opening feature, i.e. in openings: 1.54, 1.104, 1.331, 2.185, 2.187, 2.1024, 3.177, 4.29, 5.113, 5.1281, 6.647, 6.738; in closure: 1.673, 1.797, 1.918, 2.44, 2.441, 2.500, 2.560, 2.756, 2.864, 3.206, 4.511, 4.520, 4.875, 5.260, 6.1030 (Schrijvers, 1999, 2 n. 5). For the appeal to the reader generally as a closural feature, see Bonheim, 1982, 120 ff.

mortalia saecla: see above on 791.

806. multus enim calor . . . superabat: heat and moisture are the traditional prerequisites for the creation of life. It is not clear whether this heat is provided by the sun, or by the *aether ignifer* as it separates out in the creation of the world. *Superabat* as 'abounded' seems to be picked up by Verg. *G.* 2.330–1. However, the meaning 'was left over' is also appropriate here, suggesting that the greater heat of the young world was a relic of the cosmogony (*OLD* 1878.6b, see above on 800).

arvis: see on 781 and 934.

Lines 807–817: wombs in the earth, and the Earth-Mother

We may assume, although only the details of human birth are described, that this is the manner of birth for all mammals: as birds originally came out of eggs, as they do now, so mammals originally came out of wombs, also as they do now. The only difference is that, in lieu of mother birds and animals, the earth fulfilled this function.

Although there is no directly parallel idea in Empedocles, Wright (on DK31 B61) sees the 'whole natured forms', the partially modelled forms of humans, as a precedent for this idea. The theory of wombs growing in the earth is certainly the closest L. comes to Empedocles' hallucinatory early world, where separate limbs and organs wander the earth. Censorinus (*De Die Nat.* 4.9 = fr. 333 Us.) attributes the idea to Epicurus, and points out the similarities with Democritus' anthropogony. A similar idea is also used by Diodorus Siculus 1.7 (see on 807 below). The origin of the idea of the wombs has been much discussed. Many commentators, following Censorinus' attribution, consider the source is Epicurus himself (Bignone, 1916, 160–1; Robin ad loc.; Bailey ad loc.; Spoerri, 1959, 125). Waszinck (1964, 51–6) analyses the verbal correspondences between L. and Censorinus, and concludes that Censorinus takes his account directly from L. A doubtful fragment from a much weathered part of the inscription of Diogenes of Oinoanda also seems, if the reconstruction is sound, to give a similar idea, fr. 11 Smith (now lost, recorded only by Cousin and Diehl, see Smith ad loc.):

1–6 obliterated, acc. to D (G. Cousin, *BCH* 16 (1892), 1–32)
*c.*8 *c.*6
7 —— ατη —————
.βρε.ωδους η[
.ας ἐξέβαινον. [εἶ]τα [δ' οἱ]
10 τοῦ ἀνθρώπου γ[ονεῖς, ὡς]
ὁ παρὼν λόγος ἔχ[ει, ἀπὸ]
γῆς φύντες, προσ[έλαβον]
τόδε τι τῆς ἰσχύο[ς προσ]-
ὸν τῇ φύσει —————

they departed from embryonic (?) . . . [then the ancestors] of man born [according to] the present account [from the] earth [received in addition] a particular kind of strength [inherent] in nature . . . (Trans. M. F. Smith)

It may well be that Censorinus follows L., but far less likely that Diogenes does, and so we would have two Epicurean sources for the idea of the wombs, making it far more likely to be orthodox Epicureanism (see Smith, 1986; 1993, 141–3; and 1997, 67–78 on Diogenes, his sources, and L.).

The idea is similar to Anaximander's theory that humans were originally protected inside fishes (DK12 A30, see above on 794), and would serve much the same purpose in accounting for the protection of helpless infants, and so there may well have been Presocratic authority for it, or a similar theory. The source of this idea may be beyond recovery, but its function in this passage is clear to see:

Firstly, the two-stage process of the birth of mammals by spontaneous generation parallels that of birds from eggs, which in turn parallels that of cicadas from chrysalises. In this way, L. bridges the imaginative gap between the popularly accepted notion of the emergence of worms from the ground and the emergence of humans from the ground.

Secondly, the wombs are necessary to avoid both the gruesome and difficult-to-accept idea of the emergence of humans directly from the ground, as in Empedocles (DK31 B62, see below on 838 ff.). Compare Lucian *Philopseudes* 3 where he mocks the Athenians for believing they emerged from the ground 'like vegetables'.

Thirdly, the wombs are necessary, as with birds appearing from eggs, for the birth of mammals to conform to the perceived phenomenon of mammals being born from wombs in sexual reproduction.

Finally, the wombs provide an intermediate stage between sexual reproduction and spontaneous generation. In the conundrum 'which came first, the chicken or the egg?' L. solves the difficulty by comparing eggs to chrysalises, popularly thought to appear spontaneously. Thus eggs could once appear spontaneously, and so the idea of the spontaneous origin of the mammalian equivalent to eggs, wombs, is by analogy more acceptable: here the womb serves the function of the egg. So, part of a mammal appears spontaneously, from which a whole mammal emerges in the normal way as in sexual reproduction.

The Hippocratics believed that the womb was able to move around the body and that, if not held in place by pregnancy or kept moist through frequent sex, it would move towards organs such as the liver, heart, lungs, and even the brain, and become attached to them in a search for moisture (Dean-Jones, 1996, 69–77). There must be an assumption that the womb has some will or intelligence of its own. Plato in *Timaeus* 91b–d appears to go further, and describes the womb as an animal that wanders about the woman's body eager for sex and pregnancy. These ideas about the womb would perhaps make it easier for the theory of wombs existing on their own account, outside the body, to be accepted.

Inevitably, critics would seize on the fantastic nature of this theory: the Peripatetic Critolaus (ap. Philo *De Aet. Mund.* 66–7) mocks the absurdity of the idea of the earth producing wombs and breastfeeding her offspring, and later Thomas Tenison (1670, 132–3) uses it to beat Hobbes with as a putative follower of Epicurus (see below on 810), and Sir Richard Blackmore (1712, 6.41 ff.) attacks L. directly.

Origen *Contra Celsum* 1.37.22 ff. (Chadwick, 1980, 36), although he does not mention wombs, uses Greek ideas of spontaneous generation in support of the virgin birth of Jesus.

807. ubi: Bailey ad loc. translates: '"therefore when" as in 4.360', but in his main translation has 'wherever'. Schrijvers (1974*a*, 258) is very firm that *ubi* has a local sense here, but it is difficult to separate the two meanings.

loci regio: *locus* can be used for human genitalia, and especially in the plural for female genitalia or wombs, as L. does in the section on problems of conception at 4.1242, 4.1246, 4.1266, 4.1273 (see Brown ad loc.). Cf. Cic. *ND* 2.128; Varro *LL* 5.15; Pliny *NH* 1.11.84. (*TLL* 7.1578.44 ff.; *OLD* 1039.2b; Adams, 1982*a*, 94–5.) This meaning would be particularly suitable in the context of places suitable for wombs to grow.

opportuna: Bailey ad loc.: 'Sc. with the appropriate combination of atoms.' This certainly seems possible. The conditions for spontaneous generation in the present day are naturally more limited given the lesser fertility of the earth, but particular sorts of matter are involved: 'stercore de taetro' 2.872; 'lignis glaebisque . . . putrefacta' 2.897–8; 'terram | . . . cum putor cepit' 2.928–9; 'cadavera rancenti . . . viscere' 3.719. Diodorus Siculus is more precise about the locations for original spontaneous generation (1.7.2): 'and some of the *wet parts* swelled up in many places'. There also putrefaction is involved. In 2.581–97 and 2.652–4 L. explains that the world is able to produce everything because of the great variety of atoms contained within it, and this suggests that no special sorts of atoms are needed for the creation of life (*Ep. Pyth.* 89.6; Long, 1977, 71–3; see further below on 920).

It is not clear whether particular species of animals were produced in particular places, or whether any suitable wet putrefying piece of earth was able to produce any kind of animal. Diodorus (1.7.2) has wetter animals becoming fish, airier ones birds, and earthier ones land animals, but it seems probable that L. deliberately leaves the details vague.

808. crescebant: Censorinus *De Die Nat.* 4.9 in his paraphrase of this passage uses *increvisse*. L. uses *cresco* in a similar way to *gigni*, cf. 1.150 'nullam rem e nilo *gigni*'; and 1.858 'res posse neque autem *crescere* de nilo'; *oriri* 3.787–8, 3.967–70; *creare* 4.839–42, 5.787–8; and *coorior* 6.457–8 (Schrijvers, 1974*a*, 255–6 n. 28). But, there is also a sense of 'to increase in size' here, with the wombs arising from the ground and also swelling, and this is aided by the use of the imperfect rather than the aorist, as everywhere else in the passage except here and at 802. This supplies another parallel to the natural phenomenon.

uteri terram radicibus apti: the use of *radices* here unmistakably links the births of plants and animals. There is a tradition in Greek thought of analogy between the growth and nourishment of plants and that of embryos (e.g. Empedocles DK31 A70; Philolaus DK44 B13, *De Natura pueri* 22.1; Schrijvers, 1999, 11–13; Lonie, 1969). Aristotle also draws parallels between the life of plants and animals (*Hist. An.* $539^{a}18$ ff.), and compares the functions of the umbilical cord and of the roots of plants (*Gen. An.* $745^{b}24$ff. and $739^{b}33$–$740^{b}10$), as does Galen, e.g. *De Ut. Diss.* 10 (2.906.10ff.), *De Foet Form.* 2 (4.656.11–657) (see Schrijvers, 1999, 12 n. 37). The roots of the wombs serve to anchor them to the earth as with plants. We may also assume that nourishment flows from the earth to the wombs before the birth of the infants in a similar way both to the nourishment of plants and to the nourishment flowing to the infants from the earth after birth. Empedocles DK31 B62.1–2 calls his first humans 'shoots': ἀνδρῶν τε πολυκλαύτων τε γυναικῶν | ἐννυχίους ὅρπηκας. Wright (1995, 216) comments:

> ὅρπηκας With this word Empedocles relates human to plant life . . . and provides a non-mythical explanation for the autochthonous traditions as well as giving a new context to Homeric vocabulary (cf. *Iliad* 2.137–8 on Lycaon with ἐννυχίους and ὅρπηκας).

809. ubi: Bailey: 'when in the fullness of time'. Schrijvers (1974*a*, 258–9) argues with some justification for a local sense for *ubi* here and that it relates to *ibi* in 811, i.e.: 'c'est là où ces utérus s'étaient ouverts, que la nature dirigeait les canaux de la terre et qu'elle forçait à verser par les veines ouvertes un suc semblable au lait . . .'. But it would seem that *ubi* would naturally be taken as temporal by the reader coming upon it before *ibi*. Perhaps both meanings are present.

tempore maturo patefecerat aetas: strictly 'when the time was ripe', but also the notion of ripeness or maturity must attach to the infants within the wombs.

aetas: I accept Marullus' emendation *aetas*. However, the origins of *aestas* of OQ, and Lachmann's *aestus* (cf. *aestate* 803), are easy to see in the context of heat and the comparison of the spring of the youth of the world to present-day summer. Lachmann's *aestus*, i.e. 'the heat of the infants', does have some support from Diodorus Siculus 1.7.10 (see on 807, and Bailey ad loc.), but there clearly the heat that opens the wombs comes from the sun rather than from the embryos (see West, 1964, 101). In Hippocratic thinking, the baby struggles out of the womb by its own efforts, either when it reaches the correct stage of maturity, or when the food supply from the mother fails (see below on 810). In the analogy of the earth as a mother, this would make it more likely that the age of the infants is the point here.

810. The wombs are moist, as is observed in nature. This moistness again brings to the surface the underlying poetic theme of comparison with sexual reproduction.

The infants have a positive will to seek life as well as the negative will to flee the wombs, again stressing the spontaneity of their birth (see on 804). The Hippocratics considered that labour was brought on by the struggles of the baby to escape the womb, and it seems that only one Hippocratic writer was aware of the role of contractions in labour: others considered that the baby's will to be born was caused by a failure in the food supply to it in the womb, and so L. is in line with Greek scientific thought, merely transferring the impetus for the will to be born from hunger to a need to get dry and to breathe (see Dean-Jones, 1996, 211–13; Hipp. *Epid.* 5.103, and *Mul.* 1.68). On the other hand, 5.224–5 do suggest that, in the present day at least, the mother's contractions do force the baby from the womb. The phrasing makes it clear that the infants are being presented in a similar way to the birds and cicadas, thus strengthening the idea of the possibility of original human spontaneous generation.

There is a clear conceptual similarity here between the earth feeding her first children spontaneously, and Golden Age ideas of the earth providing spontaneous nourishment to the early humans, especially in the myths of rivers of milk, wine, honey, etc. (see below on 911–12, 937–8, and against this see Schrijvers, 1999, 4–5). Thomas Tenison uses the Epicurean theory to criticize Hobbes:

> to put some such cheat upon the world as Nurses are wont, in sport, to put upon children, when they tell them they started up out of the parsley-bed . . . by supposing certain swelling bags or wombs upon the earth, which brake at last, and let forth infants nourished by her juice . . . (Tenison, 1670, 132–3)

The paragraph is framed by the echo of *convertebat* by *convertitur* in 815 underlining the analogy between the earth and a human mother.

811. convertebat . . . natura: *natura* now takes an active role in the process of birth, behaving as a nursing mother, and directs a stream of nourishment to the new-born creatures, very much as the Earth-Mother does in the traditional analogy, just as a mother, in Hippocratic thinking, diverts the stream of nourishing menstrual blood from the embryo to her breasts to form milk (see below on 814–15).

Venus, the *Terra Mater*, and the *Magna Mater* all function as personifications of nature in *DRN* (e.g. 1.2, 1.21, 1.55–7, 1.227 ff., 2.168, 2.173), and the process of conversion of the creative principle of the universe from Venus to *natura* can be seen at 1.54–7. Here *natura* reverses the process and adopts the role of *Terra Mater*, and behaves just as *alma Venus* in 1.2, nurturing the first life after having just created it in her guise as *Terra Mater*.

Natura and *φύσις* notoriously have a vast range of meanings (see the 66 meanings identified by Lovejoy and Boas 447–56 'Some Meanings of Nature'). The Epicurean usage would generally be along the lines of Lovejoy and Boas' categories 10, 12, 13, and 14: 'the underlying primary and permanent substance' (the atoms themselves), 'the process of cosmic development', 'the cosmic law or general scheme of things', and the 'physical world as a whole'. That is, *natura* would describe the atomic microscopic make-up of the world, the macroscopic expression of the underlying atomic reality (the world we see), and the process by which the latter is expressed by the former (see Kennedy, 2002, 75–117). This is explained at 1.54–7:

> nam tibi de summa caeli ratione deumque
> disserere incipiam et rerum primordia pandam
> unde omnis Natura creet res auctet alatque
> quove eadem rursus natura perempta resolvat.

Natura is a description of the process by which all things come into existence and dissolve again into their component atoms, but she moves in the above passage from simply 'the atoms', and becomes a personified controlling force. The personification is thus clearly a 'semantically transparent place-marker' (Fowler, 2002, 242–4): a convenient shorthand for an autonomous ungoverned process. Fowler (2002, 242–4) identifies seven different ways *natura* is personified in L.: *creatrix* (e.g. 1.199), provider (e.g. 1.263), permitter/forbidder (e.g. 1.224, 5.846), demander (e.g. 2.17), forcer (e.g. 5.1028), governor (e.g. 5.77), and destroyer (e.g. 1.57). Epicurus avoids personification of *φύσις* generally (except fr. 369 Us.), but it is very much a Latin tendency (Fraenkel, 1960, 95–104), heavily used by Cicero in the philosophical works (Pease on Cic. *ND* 2.81).

However, the personification of *natura* as an active force comes close to Lovejoy and Boas' category 15: 'as personified, especially "Mother Nature" . . . the term in this sense tends to become a substitute for "God as efficient cause" '. Of course L. means no such thing by *natura* here, but it is very useful for him to appropriate teleological language, and thus to replace divine control of the universe by a random mechanistic process. There is a danger that *natura* will be misread as a real force, and so hand a weapon to critics such as Minucius Felix, as in *Octavius* 19.8: 'Epicurus ille, qui deos aut otiosos fingit aut nullos, naturam tamen superponit' (cf. Sen. *De Benef.* 4.7.1), but the value of simply replacing God with an empty but resounding term is far greater than any danger of real misunderstanding. This role of *natura* replacing divine control of the universe is clearly explained by L. at 2.1090–2, and Balbus in Cicero *ND* 2.81–2 accurately contrasts the Stoic and Epicurean positions. The feminine nurturing role of *natura* here underlines the gender polarity between the thinking of the Epicureans and Stoics. The latter posit a masculine *controlling* universal force, later Stoics especially allegorizing the *pneuma* as Zeus (see esp. Cleanthes *Hymn to Zeus SVF* 1.537, L&S 54I), L. has a feminine creative, nurturing force with which to supplant it. The process is well explained by Asmis, 1982, and illuminated by Fowler, 1996*a*, 'The Feminine Principal' (= 2002, 444–52).

See further: Catto, 1988–9; Fowler, 2002 on 2.168; Clay, 1983, ch. 3 esp. 85, 93–4, 227–8, and 305 n.14; Segal, 1990, 196–207; Schiesaro, 1990, 102 ff.; Sallmann, 1962.

foramina terrae: the *foramina* here clearly serve a different function from those in 5.457 through which the fire-bearing *aether* escapes from the earth during its formation, and those in 6.592 through which the wind rushes causing earthquakes, and would seem to be identical with the *venae apertae* of 812 (see below, and Schrijvers, 1974*a*, 259).

812–13. sucum . . . | consimilem lactis: Censorinus *De Die Nat.* 4.9 (Epicurus fr. 333 Us.) attributes this detail of a milk-like juice to Epicurus, but probably takes it directly from L. (Waszinck, 1964, 51–6): 'et infantibus ex se editis ingenitum lactis umorem natura ministrante praebuisse'. Further, a report of Archelaus shows the idea is also Presocratic, DK60 A1 (Diog. Laert. 2.16–17):

> *γεννᾶσθαι δέ φησι τὰ ζῷια ἐκ θερμῆς τῆς γῆς καὶ ἰλὺν παραπλησίαν γάλακτι οἷον τροφὴν ἀνιείσης· οὕτω δὴ καὶ τοὺς ἀνθρώπους ποιῆσαι.*

> Living things, he holds, were generated from the earth when it was heated and threw off a slime like milk to serve as a sort of nourishment; and thus the earth also produced humans.

A similar idea of Archelaus is also reported by Hippol. *Ref*. 1.9.5 (DK60 A4) who also speaks of the first animals and humans 'feeding on slime' *ἐκ τῆς ἰλύος τρεφόμενα*.

This nourishing of the new-born is the second stage in the process of showing how animals could have been born originally by spontaneous generation and reared without parents. Firstly, they grow in wombs, now they are nourished with milk as by a mother. Aristotle argued that this idea is impossible (*Gen. An*. 762^{b}28 ff.). Plato (*Menex*. 237b–238a) has Socrates supporting the idea that Attica produced the first humans autochthonously and also produced grain for their nourishment: 'for in pregnancy and child-birth, the earth does not imitate a woman but a woman the earth' (see Blundell, 1986, 58, and Loraux, 1993, 9). Schrijvers (1974*a*, 260) points out a traditional analogy between the sap of plants and maternal milk (Arist. *De Plant*. 829^{a}7 ff., *Hist. Plant*. 1.7.2; Theophr. *CP* 6.4.1 and 6.9.2; Ov. *Met*. 11.606; Verg. *A*. 4.514; Hippoc. *Nat. Puer*. 21.5 and 26.3; see also Spoerri, 1959, 123–6, and Waszinck, 1964, 55–6). At 1.250–64, L. himself draws a parallel between the rains of the sky-father, the crops of the Earth-Mother, and the milk of animals (cf. Verg. *G*. 2.324–6, and see West, 1969, 4–7).

venis . . . apertis: the Earth-Mother is identical to a human mother even in the details of lactation, and the *foramina* are now specified as *venae*. The Hippocratics think of maternal milk as a form of blood redirected through the veins to the breasts (see below on 814–15). The idea of a 'milk vein' in cattle was, according to James Herriot, still prevalent amongst farmers until the middle years of the twentieth century. In 2.1105–63, L. uses an extended analogy of the earth as a living creature, in which *venae* are used in a metaphorical way for the channels by which 'nourishment' enters the earth (2.1119, 2.1136, 2.1148). Here it is clear that the veins are real and not simply metaphorical. Aristotle draws a comparison between the roots of plants and the veins of animals (*Gen. An*. 776^{a}27 ff.; Schrijvers 1974*a*, 258–

61). It seems likely that L. is presenting a similar comparison here between the birth and nourishment of plants and animals. This aids the transition from the origin of plants by spontaneous generation to that of animals by the same mechanism. The parallel between the two would inevitably be drawn, as it is by Lucian *Philopseudes* 3, comparing the autochthonous birth of Athenians to vegetables. For a similarly neat transition from veins in the earth to human veins, compare Ov. *Met.* 1.410 of the metamorphosis of stones into humans in the story of Deucalion and Pyrrha: 'quae modo vena fuit sub eodem nomine mansit' (see Calvino, 1999*b*, 32).

814–15. quod omnis | impetus in mammas convertitur ille alimenti: this idea of a flow of nourishment, *impetus . . . alimenti*, is derived from Greek medical thinking: the Hippocratics considered that the embryo in the womb was nourished by menstrual blood, and that when the baby was born the menstrual fluid was redirected to the breasts where it was converted to milk. Of course, when a woman was not pregnant the menstrual blood was excess to requirement, and thus menstruation was accounted for (see Dean-Jones, 1996, 211–24; Hippoc. *Alim.* 37 (ix. 110. 16–18); and Arist. *Gen. An.* 777^{a}21–8. For breast milk as 'sister to the menses' see Hippoc. *Epid.* 2.3.17 (v. 118. 10–11). See also on 827 below for Greek ideas of menstruation involved in the ageing process).

Cicero has the Stoic Balbus using the seemingly providential onset of lactation at the time of birth as a proof of the intelligent design of creatures in *ND* 2.128.

mammas: in the analogy *mammae* are equivalent to the *venae* and *foramina*. The progression is thus: mineral → vegetable/animal → animal/human. (See note to *venis* 812 for the animal/vegetable analogy.) *Mammae* is used both of human breasts and animal udders, e.g. Martial 2.37.2; Cato *Agr.* 157.4; Pliny *NH* 16.151 and 17.118 (*TLL* 8.246.78 ff.).

816–17. terra . . . | praebebat: almost as if in answer to an implicit objection: 'who provided food, clothing, and bedding for the children, since they had no parents?' Of course this is the key problem for any theory of original spontaneous generation of animals and humans without evolution from simpler creatures to more complex ones, and is the reason behind Anaximander's fish-like creatures. (See on 794 above.)

cibum . . . vestem . . . cubile: the sequence is that of the daily care of a mother for her child, and these are also the three imperatives in child care, and the easily obtainable necessities of life in Epicureanism, here provided freely by the earth in a similar way as in the Golden Age myths (see on 937 ff.).

vestem vapor . . . | praebebat: i.e. there was no need of clothing because of the warmth of the young world. See on 1011 ff. for the invention of clothing and the physical and psychological consequences for humans.

herba cubile | praebebat multa . . . abundans: again the greater fruitfulness of the young earth is stressed, as in 2.1157–74, see on 826 ff. Bailey would prefer to take *abundans* with *cubile*, but probably it goes with both *herba* and *cubile*. Contrast the alfresco sleeping in 5.972, where it is uncomfortable and unromantic.

molli lanugine: see above on 780–1. The softness of the young earth now plays a practical role in the care of her children (cf. Pl. *Plt.* 272a).

Lines 818–820: the climate of the young world

The mildness of the climate in the youth of the world is a very common part of the *Bildungsgut* of prehistory, especially in mythological accounts of the Golden Age. It is implicit in Hesiod's account of the Golden Race, and the ease of life and spontaneity of crops they enjoy, in Homer's isle of the Cyclopes (*Od.* 9.106 ff.), explicit in myths of Olympus (cf. *DRN* 3.18–22 = *Od.* 6.42–6), and the Elysian Fields (cf. *Od.* 4.561–8; Verg. *A.* 6.637 ff.), and in ancient Indian Vedic literature (see L&B 433 ff.). Later occurrences are more numerous than earlier ones, and it becomes one of the distinguishing features of such lands as the Isles of the Blessed, the Fortunate Isles, and the lands of certain Noble Savages, such as Ethiopia, Britain, Ireland, and Albania (cf. Pind. *O.* 2.68–76; Horace *Epod.* 16.40–65; Plut. *Sert.* 8–9.571–2; Strabo *Geog.* 1.1.4–5; Lucian *Vera Hist.* 2.4–16; see esp. L&B 290 ff.). Further, it may well lie behind the reference to year-round production of fruit in Empedocles DK31 B77 and B78. Compare Vergil's description of the beginning of the world as spring, *G.* 2.338–9 (cf. Gale, 2000, 218–19):

ver illud erat, ver magnus agebat
orbis et hibernis parcebant flatibus Euri

and Ovid on the Golden Age, *Met.* 1.107–8:

ver erat aeternum, placidique tepentibus auris
mulcebant zephyri natos sine semine flores.

The ancient and modern parallels are too numerous to quote here, but some are collected in Appendix B, under 'Climate'. Accordingly, L.'s first humans are born into a characteristically Golden Age landscape. L. appropriates and uses this topos, using mythology against itself, and supplying both a physical mechanistic explanation for the original spontaneous generation of humans and animals, and here, an explanation of the survival of infant humans without parents.

The equability of the climate extends to moderation of heat as well as cold. The physical reason for this is not clear, although 820 follows in explanation. The kindliness of the weather is, however, guaranteed by the analogy: as winter winds die down in spring, so in the youth of the world the same climatic features were found.

There may also be an Empedoclean motif present in the calming of winds in the youth of the world: as Venus soothes winds and waters in *DRN* 1.6 ff., based perhaps on an Empedoclean original (Sedley, 1998, 15 ff.), so the climate of the world under Love may be more kindly than that under Strife, as the storm of new fr. d M&P suggests. In L., this idea of weather increasing in strength with age is not clearly explained by the physics, since at 1.759–62 and 5.436–42 he speaks of a storm of elements in the beginning of the world, and there we have a *calming* of elemental forces after the first formation of the world allowing the spring of the creation of life. In Empedocles' cosmogony the growth of Love would have a calming, quietening effect, while the growth of Strife, separating out the elements once more, would lead to greater chaos, and back towards the storm of elements, and so towards greater environmental instability. For other accounts of a storm of elements in the formation of the world see O'Brien, 1969, 268–73, e.g. Tzetzes *Allegoriae Iliadis* prol. 287 ff. and *Exeg. in Il.* 41.44 ff.; Plut. *De Esu. Carn.* 993 C–E; Arist. *Ph.* 196^{a}19–23; and Pl. *Plt.* 273a–b. The calm before the storm motif is also in tune with mythological accounts of the Golden Age, where after the end of the eternal spring the weather worsens, bringing in heat and cold, and harsh winds. This is often ascribed to the deliberate will of Jupiter, e.g. Verg. *G.* 2.335 ff.; Ov. *Met.* 1.113 ff.

820. crescunt: this verb is used of the growth of trees at 787 and of the wombs at 808, thus linking this idea with the growth of plants and animals.

Lines 821–825: justification of the Earth-Mother analogy

821. etiam atque etiam: West (1964, 101): 'a regular resumptive phrase'; Costa (1984, 101): 'One of L.'s favourite assertive phrases'; Bailey ad loc.: 'I repeat again and again.' However, *etiam atque etiam* can be simply 'again and again' (*TLL* 5.2.930.18 ff.), i.e. 'Having gained the maternal name again and again, the earth keeps it deservedly.' The idea is repeated from 795–6, as if in answer to an objection that such ideas are false in Epicurean thinking, and as in 795–6 there would seem to be an appeal to the *consensus omnium* (see above). The implicit argument seems to be: 'Such ideas are usually false but because of its ubiquity, there is more justification than usual.' Such personifications are allowed by L. so long as it is realized that they are only metaphors (2.644–60).

Here the explanation has a limiting effect: 'The earth can be called mother to the extent that she created the human race', with an implicit bar on any other reason for the appellation. This is as near to the disclaimer of the truth of the *Magna Mater* myth in 2.644–60 as we are given in book 5, and here it is not nearly so clearly distinguished from the analogy as in book 2.

822–3. genus . . . | humanum atque animal: the double elision in *human(um) atqu(e) animal* functions as in 3.136 *anim(um) atqu(e) animam* where the closely intertwined relationship between the 'parts' of the soul is illustrated, and here stresses the closeness of humans and animals. Compare 1.1: *hominum divomque voluptas*, and Vergil's version, *G.* 3.242: *hominumque ferarumque* both of the effect of Venus (see below on 824). Schrijvers (1974*a*, 261) points out the ancient etymology of *humanum*: Quint. 1.6.34 'etiamne hominem appellari quia sit humo natus' (Maltby, 281, 284), just as in 5.925–6 (see further above on 791). Empedocles in the Creation under Love, DK31 B35.7 and 16, says simply ἔθνεα . . . θνητῶν, but in a(ii) 26–8 links humans, mountain-roaming beasts (as in 824), and plants in the same process of creation (see below on 824 and 864–6).

823–5. humanum . . . animal . . . volucres: note the reversal of the order of humans, animals, and birds from 801–10 (Bailey ad loc.). Bailey rightly dismisses any idea of a reversal in the order of their creation but insists wrongly that the three are distinguished by separate creations. The yoking together of these three groups of creatures stresses the contemporaneity of their births, and the reversal owes more to rhetoric. Compare the universalizing of Venus' creative powers in 1.1–5. Further, the phrasing is strongly Empedoclean, as can be seen from the description of the zoogony under Love in DK31 B35.14–17. Compare also Strasbourg fr. a(ii) 26 M&P (see below on 826). Plato's *Timaeus* (42a ff., 91d ff.) does use a similar inverse order, with humans created first, and then birds, land animals, and fish, and this perhaps influences L. here. Both Empedocles and L. stress the great variety of nature: all animals that we see today poured forth from the earth suddenly in her youth.

823. prope certo tempore: the earth gave birth to animals and humans at nearly a fixed time: in her youth. The period of bearing is limited (see 826–36 for the reasons) but does go on over a period of time (*prope*). This phrase links the births of animals and humans, which both occur at the same time. Empedocles gives a similar idea of the suddenness of the birth of the animals from the earth in DK31 B35.14 αἶψα (see above).

fudit: cf. 917 below, Verg. *G.* 1.12–13 and 2.459–60 (Gale, 2000, 29 and 171 n. 77). *Fundo* and the Greek χέω are frequently used of birth (*TLL* 6.1.1567.53 ff.), cf. Empedocles DK31 B35.7 and 16 (see above).

824. in magnis bacchatur montibu' passim: the mountain theme crops up again at 5.946 where the streams rush down calling to the thirsty wild animals, at 5.992 where the mountains are filled with the groans of people being eaten by wild animals, at 5.1244 where woodland warfare burns down the woods in the mountains, and at 5.1370 where agriculture forces the wilderness to retreat up into the mountains. This theme usually signifies wildness and naturalness, very much as with the woodland theme, with which it is connected as is traditional (see Appendix B).

This phrase is probably modelled on an Empedoclean original, as Strasbourg fr. a(ii) 26–7 M&P suggests. Empedocles introduces the zoogony under Love, promising to describe the 'coming together and unfolding of the stock' of humans, plants, and 'the wild species of mountain roaming beasts':

> *τοῦτο μὲν [ἄν] θηρῶν ὀριπλάκτων ἀγ[ρότερ' εἴδη?,]*
> *τοῦτο δ' ἀν' ἀ[νθρώ]πων δίδυμον φύμα, . . .*

on the one hand among the wild species of mountain-roaming beasts
on the other among the twofold offspring of humans.

L. echoes a(ii) 26 more exactly at 2.1081: 'sic montivagum genus esse ferarum' (see M&P ad loc.; Sedley, 1998, 24–5; and further below on 864–6).

bacchatur inevitably recalls the rites of Dionysus (*TLL* 2.1663.33 ff.), which are closely associated with Cybele (*Magna Mater*), the goddess of fertility and also of mountains and wild animals (*OCD* 416–17, 479–82). Cybele makes the rites lawful (Eur. *Bacch.* 78–9; Guthrie, 1950, 145 ff.), and thus *bacchatur* also recalls the *Terra Mater*, who shares a role with Venus and Cybele as a personification of nature in *DRN* (see above on 811). The wild animals here behave very much as they do in reaction to the arrival of Venus in the, perhaps, Empedoclean hymn to Venus in 1.14–17, swimming rivers and climbing *mountains* in their joy:

> inde ferae pecudes persultant pabula laeta
> et rapidos tranant amnis . . .
> denique per maria ac montis fluviosque rapacis

Columella uses the word in a very similar context of the effects of Venus in the creation of life in spring, *Rust.* 10.196–9:

> nunc sunt genitalia tempora mundi,
> nunc amor ad coitus properat: *nunc spiritus orbis*
> *bacchatur* Veneri stimulisque Cupidinis actus
> ipse suas adamat partes et fetibus implet.

Vergil in *G.* 3.209 ff. takes issue with L.'s view of the creative and civilizing power of Venus (see below on 1017), stressing the dangerous, destructive side of love. He appropriates the swimming rivers/climbing mountains theme from 1.14 ff. (e.g. 3.213, 3.253–4, 3.258–63, 3.270), to illustrate the *mania* of love, and borrows L.'s Empedoclean phrasing from *DRN* 1.3–4 and 2.1081–3 to make his point, *G*. 3.242–4:

> omne adeo genus in terris hominumque ferarumque
> et genus aequoreum, pecudes pictaeque volucres
> *in furias ignemque ruunt*: amor omnibus idem.

(see Know, 1992; Gale, 1991; Miles, 1975). This dialogue between Vergil and L. is illustrated by Piero di Cosimo in *The Forest Fire*, where the fire, symbolic of the passion of love, causes the animals on the left to leap and swim the river.

So, as often in this passage, Venus appears, here via Dionysus and Cybele, and Empedocles' zoogony under Love. The introduction to the *Magna Mater* passage in book two reminds us of Cybele's role as goddess of wild animals, 2.597 '*montivago generi* possit praebere ferarum' (see *OCD* 416; Guthrie, 1950, 59–60; Frazer, 1922, iv, ch. 34), and, of course, the reaction of women to Dionysus is similar (Eur. *Bacch*. 217–20). *Bacchor* is frequently associated with mountains, woods, and winds (*TLL* 2.1664. 20 ff., e.g. Verg. *G*. 2.487, *A*. 3.125), from the wild mountainous setting of Bacchic rites.

825. simul presents a problem for Bailey since he insists that L. describes separate generations for humans, animals, and birds. He concludes that 'either L. here is regarding the whole process of the creation of living things as belonging to one epoch (cf. *prope certo tempore* 823) or *simul* simply means "with them", "also"'. The problem is removed if we assume that humans and all animals including birds are generated from the earth at the same time (see above on 801 and 805). Bailey points out the ambiguity in this phrase (and in 1.589 and 5.801): 'variegated in their plumage' or 'of different species'. He concludes that, given the context of fixity of species here and in 1.589 and 5.801, the latter is more probable. It would seem likely that both meanings are present, the former adding a touch of decoration, but both underlining the ability of the Atomic theory of creation to account for the great variety of nature (see further above on 801).

Lines 826–836: the decline of the Earth-Mother and the flux of all things

826–7. The earth must have stopped bearing animals by spontaneous generation, as women stop bearing, because of age. Since the earth gave birth as a woman does, her other behaviour must also be analogous.

828–33. This is followed by a further proof: that all things are in constant flux.

834–6. Then this is used to prove that the earth has changed her nature, and no longer gives birth by spontaneous generation.

In 2.871–3, 2.898–901, 2.926–9, 3.719–21, and 5.797–8, L. assumes the reader's agreement with the present-day spontaneous generation of worms and cicadas as a fact, but his problem is to show how large animals were able to be spontaneously generated in the beginning of the world. This argument supplies the answer to an implicit objection by the reader, along the lines of Critolaus (Philo *De Aet. Mund.* 55 ff.): 'How was it that large animals were created by the earth when we do not see this today?'. West (1964) gives the correct analysis of the passage outlined above: 'This section has been unfairly criticized by the commentators, mainly because they have not paid proper attention to the clear marking of the argument by *enim* 828 and *namque* 832.'

826–7. Here age wears out women so that they are unable to give birth. Seemingly, their general physical condition prevents them. Columella reports a similar view of the agricultural writer Tremelius Scrofa, 2.1.2: 'credidit [Tremelius] parentem omnium terram, sicut muliebrum sexum aetate anili iam confectam, progenerandis esse fetibus inhabilem'. The Hippocratic writers seem to have taken no great interest in the menopause, and they do not put forward any explanation for it, but Dean-Jones (1996, 105–9) extrapolates from the theories of Aristotle (*Long.* 46^a17–21 and *Resp.* 479^a15–21) that loss of menstrual blood led to a drying up and cooling of the body, which caused ageing and so loss of fertility. As the body becomes drier due to loss of menstrual blood and other fluids it loses the capacity to produce the menstrual fluid necessary for feeding the embryo in the womb, and so child-bearing becomes impossible. (See on 814–15 for the Hippocratic idea of menstrual blood feeding the embryo in the womb.) This, to a degree, fits the view of the senescence of the world given in 2.1105–74, where the loss of fertility of the earth is also explained as a mechanistic process, but caused by a loss of atoms rather than of fluid. Diodorus 1.7.6, however, does explain the inability of the earth to bear large creatures now as a consequence of her drying out and hardening (see further below on 828 ff.).

This idea of an aged earth seems at variance with L.'s idea at 5.330 that the world is still young. However, L. is quite at liberty to put forward any hypothesis to explain unseen phenomena that accords with the facts, as explained by Epicurus *Ep. Pyth.* 85–8, and since prehistory is something unknowable by its nature, multiple explanations are permissible (see Schiesaro, 1990, 97–101, and Schrijvers, 1978, 91–4 with D. J. Furley's reply on pp. 117–18). Secondly, the analogy is with a menopausal woman rather than an elderly one, and also need not be entirely parallel in that the earth's period of fertility may take up a far smaller proportion of her life than is the case for a human mother. Indeed it seems clear that the spontaneously produced creatures would need to take over from the earth by reproducing sexually after the first generation, and so the earth's period of fertility may be very short: as is traditional, zoogony is actually a function of cosmogony, and so the two processes are partly contemporaneous (5.416 ff.). Hippolytus similarly reports Archelaus: 'the earth's fertility was short-lived' (DK60 A4), and Diodorus 1.7.6 sets the beginnings of sexual reproduction just after the formation of the world. Thirdly, ancient arguments on the age of the earth centre around the destructibility or indestructibility of the world: Sedley points out that the argument at 5.324 ff. is an inversion of the arguments of Theophrastus (fr. 184 FHS&G), who criticizes four arguments of those who claim that the world is destructible, the fourth of which is that if humanity is of recent origin then we are not eternal, and so neither can the world be (Sedley, 1998, 166 ff.). Accordingly, a young earth aids L.'s argument on the destructibility of the world, but here may be dispensed with in favour of the more useful middle-aged earth theory.

The age of the earth has provided a source of fierce argument in modern times between Creationists and Evolutionists. Some Creationists have insisted on Archbishop Ussher's Biblical creation date of 4004 BCE. Modern Creationists divide into two groups: young earth and old earth Creationists. The former insist on the literalness of Genesis and Biblical dating for the earth, while the latter are able to accept an old earth and even to allow evolution into the view of a divinely created world.

828–36. mutat enim mundi naturam . . . quod tulit ut nequeat, possit quod non tulit ante: the idea that the universe is in constant flux is at least as old as Heraclitus, who was famous for the doctrine, perhaps undeservedly through Plato's attribution to him of *πάντα ῥεῖ*, and of course the famously obscure flowing river simile (DK22 B12 = fr. 40 Marcovich. See Pl. *Crat.* 440c; KRS 186–7; Marcovich, 1967, 206 ff.; Hussey, 1972, 32–59; cf. Arist. *Metaph.* 987^a32). His concern seems to be more of a changelessness underlying change, e.g. DK22 B30:

> *κόσμον τόνδε, τὸν αὐτὸν ἁπάντων, οὔτε τις θεῶν οὔτε ἀνθρώπων ἐποίησεν, ἀλλ' ἦν ἀεὶ καὶ ἔστιν καὶ ἔσται πῦρ ἀείζωον, ἁπτόμενον μέτρα καὶ ἀποσβεννύμενον μέτρα.*

This world-order [the same of all], did none of gods or men make; but it always was and is and shall be: an everliving Fire, kindling in measures, and going out in measures. (Trans. KRS)

This idea is also fundamental to Empedocles, who postulates four eternal unchanging elements beneath the constant cyclical change of the universe, e.g. DK31 B26 (see Wright ad loc.):

> *ἐν δὲ μέρει κρατέουσι περιπλομένοιο κύκλοιο,*
> *καὶ φθίνει εἰς ἄλληλα καὶ αὔξεται ἐν μέρει αἴσης·*
> *αὐτὰ γὰρ ἔστιν ταῦτα, δι' ἀλλήλων δὲ θέοντα*
> *γίγνοντ' ἄνθρωποί τε καὶ ἄλλων ἔθνεα θηρῶν,*
> *ἄλλοτε μὲν φιλότητι συνερχόμεν' εἰς ἕνα κόσμον,*
> *ἄλλοτε δ' αὖ δίχ' ἕκαστα φορεύμενα νείκεος ἔχθει,*
> *εἰσόκεν ἓν συμφύντα τὸ πᾶν ὑπένερθε γένηται.*
> *οὕτως ᾗ μὲν ἓν ἐκ πλεόνων μεμάθηκε φύεσθαι,*
> *ἠδὲ πάλιν διαφύντος ἑνὸς πλέον' ἐκτελέθουσι,*
> *τῇ μὲν γίγνονταί τε καὶ οὔ σφισιν ἔμπεδος αἰών·*
> *ᾗ δὲ τάδ' ἀλλάσσοντα διαμπερὲς οὐδαμὰ λήγει,*
> *ταύτῃ δ' αἰὲν ἔασιν ἀκίνητοι κατὰ κύκλον.*

the earth certainly cannot bear anything nowadays that she did not bear before. West (1964, 102) provides a solution by showing that Bentley's emendation has always been mistranslated: 'Clearly the relative clauses are subject not object, so that what bore cannot (namely earth), and what could not bear can (namely the parents of each species).' This is certainly the sense required, and provides the reference to sexual reproduction. Wakefield reinstates *potuit* of OQ, which produces the required reading more naturally. This leaves the problem of the missing *ut*. Wakefield says simply: 'alia loca iam occurrerunt, in quibus poeta noster, more plane suo, voculam *ut* omisit: adeoque nihil ausim ex arbitrio novare'. Cf. Ovid's variation on this line in *Met.* 15.184–5:

> et nova sunt semper; ***nam quod fuit ante, relictum est,***
> ***fitque quod haud fuerat,*** momentaque cuncta novantur.

§3 Lines 837–877: The Origin of Species

Lucretius describes the creation of the world in 5.416 ff. as the result of random collisions of a large number of atoms over a long period of time. Given a large enough supply of atoms and a long enough time, it is inevitable that enough fruitful collisions will take place to produce the atomic compounds that will eventually form a world. The process is entirely chaotic, subject to no plan, design, intelligence, or control (5.419–21), and is governed only by the limit on the number of possible types of atomic combinations, which ensures the regularity of the phenomenal world (see below on 878 ff.). Compare Hume's Philo (*Dialogues Concerning Natural Religion* pt. 8):

> A finite number of particles is only susceptible of finite transpositions: and it must happen, in an eternal duration, that every possible order or position must be tried an infinite number of times. . . . Is there a system, an order . . . by which matter can preserve that perpetual agitation . . . and yet maintain a constancy in the forms which it produces? . . . There certainly is such an economy: for this is actually the case with the present world. The continual motions of matter, therefore, in less than infinite transpositions, must produce this economy or order . . . but wherever matter is so poised . . . and yet preserves a constancy in the forms, its situation must, of necessity, have all the same appearance of art and contrivance which we observe at present . . .

This process of creation by random combinations of atoms is mirrored by the creation of life in 5.772 ff. We are not given there a microscopic atomic explanation of zoogony, and this must be supplied from 2.700 ff. The random nature of creation is, however, described in macroscopic terms here at 5.837 ff., where the earth creates many monsters (*portenta* 837) at the same time as viable creatures. Here it is clear that no pre-existing pattern for life is available for the earth to follow in her creation. She throws up creatures at random: some without gender (*androgynum* 839); some without eyes (*sine vultu caeca* 841); some without feet (*orba pedum* 840); without hands (*manuum viduata* 840); without mouths (*muta sine ore* 841); and some with their limbs not properly separated from their bodies and so unable to move (*vinctaque membrorum per totum corpus adhaesu* 842).

Clearly, these creatures will die out very quickly: some will be eaten by others (*nec vitare malum* 844), some will starve (*nec sumere quod foret usus* 844, *nec reperire cibum* 848), and all of them will be prevented from breeding, either by lack of the proper organs or by dying before they have a chance, and so will be unable to found a species (*procudere saecla* 850). Thus, we have a scheme of individual extinctions in the first generation of creatures produced spontaneously from the earth. We may assume that Lucretius' list of *portenta* is not exhaustive. If the earth produces creatures without a pattern for life, then anything is possible. We may imagine many other creatures that come together in ways that prevent them living for more than a few moments, perhaps without other essential organs or simply with their organs and limbs wrongly arranged.

The purpose of this scheme of extinctions is clear. It explains the adaptation of animals to their environment without the need for an overarching vitalistic or organizing force to design creatures, and to divide them into species. All possible animals came into being at the same time in the beginning of the world, but only some of them were viable, and so were able to breed and continue their line. The others simply died out. Thus, we have an anti-teleological scheme of adaptation and the origin of species that denies the operation of providence in the 'design' of animal life of the sort found in Cicero *De Natura Deorum* 2.120–53, where the Stoic Balbus uses the apparently perfect conformation of creatures, and their perfect adaptation to their environment, as proof of purposive design in the world (compare the argument of Hume's Cleanthes, *Dialogues* pt. 2).

This sort of thinking is, of course, still very prevalent in both science and religion, and still today many scientists see purposive design in both physics and biology. As Gould says, (1985, 401) it is very difficult to *disprove* the existence of purposive design in the universe, and any fair-minded analysis must accept the possibility that the phenomenal world is the outcome of design, but it also must be seen that any complex system will inevitably have the appearance of design, since we ourselves are a product of that system and can only view it from within, and if not designed, must be the outcome of a long chain of extremely improbable coincidences. However, since *something* must happen, some outcome must exist, and any outcome must be just as improbable as any other. Fred Hoyle has calculated the odds against DNA occurring by chance at $10^{40,000}$ to one (Hoyle and Wickramasinghe, 1981), but this statistic is less impressive if we consider that every possible outcome of the long chain of coincidences that led to the formation of DNA also has the same odds against. If we add them all together, then the probability is one, or certainty. Every intelligent creature within any one of the myriad possible universes will be able to make the same mistake, and appeal to such statistics as proof of universal design. (See V. Stenger, 'Intelligent Design: Humans, Cockroaches and the Laws of Physics', 1997, in the 'Talk Origins Archive' at http:// www.talkorigins.org/faqs/cosmo.html, accessed 12 April 2003, and Dennett, 1995, 28–31.)

The Epicurean theory that species arose randomly as a product of chaotic atomic combinations, is reminiscent of Fred Hoyle's often quoted complaint that the idea that adaptation arises by random natural selection is as likely as a hurricane blowing through a junkyard producing a Boeing 747. However, Lucretius would argue, in a junkyard full of potential 747 parts, given a long enough time, and a strong enough wind, such a result is inevitable (but see Stephen Pinker's analysis in 'The Big Bang', in Mark Ridley, 1996, 353–66). There is considerable argument among Darwinists about how random natural selection is, and what role chance plays in evolution. Some see the process as entirely chaotic, others come close to Democritean physical determinism (see esp. John Wilkins, 1997, 'Evolution and Chance', online in the 'Talk Origins Archive' at http://www.talkorigins.org/faqs/chance/chance.html, accessed 16 August 2001). Many of the arguments are remarkably similar to those over the role played by chance in Epicurean physics, especially on the point of whether events are entirely indeterminate (as I would argue), or simply indeterminable (see especially Long, 1977).

Lines 837–854: hopeful monsters

Lucretius' is one of only two detailed mechanistic accounts of adaptation extant from the ancient world, the other being that of Empedocles. However, we may assume that Epicurus' theory was not fundamentally different from Lucretius', and that at least Democritus and Leucippus had very similar theories. It is possible that, as Simplicius says (*in Phys.* 198^{b}16–34; *CAG* 9.371.33–372.11), all the ancient mechanist physicists, including the Epicureans, held similar views. It is also quite possible, however, that Simplicius simply rehearses the Aristotelian line of complaining that the Presocratics concentrated excessively on the material cause and neglected the final cause, and thereby assumes that all their theories of the origin of species were essentially similar.

The similarities between Lucretius' and Empedocles' accounts are striking, although, due to the fragmentary nature of Empedocles, the relationship between them is difficult to pin down precisely (see further Introduction, 'The Creation and the Origin of Species'). The closeness of the Epicurean and Empedoclean theories seems to have been recognized in antiquity at least as early as Plutarch (*Adv. Col.* 28.1123 B), who uses Empedocles' 'man-faced ox-creatures' to criticize the positivist theory of sense perception of the Epicurean Colotes. In the Renaissance Piero di Cosimo added the Empedoclean touch of 'man-faced pig-creatures' to his Lucretian prehistory panel *The Forest Fire*, and M. Burghers in his frontispiece to Thomas Creech's translation of *DRN* (5th edn., 1700) includes an 'Empedoclean' 'man-faced sheep-creature' in his illustration of the Lucretian Creation. In the following commentary, I attempt to show that Lucretius follows, at least part of, Empedocles' zoogony and anthropogony from the *Physics*.

There is considerable disagreement over the degree and type of influence Empedocles has over Lucretius. Sedley prefers to see only poetic influence (1998, 16–21), while Furley (1970, 55–64 = 1989, 172–82) argues for Empedocles as a forerunner of Epicurean Atomism, and as a philosophical source for Lucretius. I incline towards Furley's view (see Campbell, 2000). Perhaps the main similarities with Empedocles in this section are at 839, 842, 845, 847, and 864–6 (see notes ad loc.). Furley (1970, 61) sees 837–41 as a translation of Empedocles DK31 B57. However, as Sedley says (1998, 20 n. 74), the resemblance is too loose to be called a translation. On the other hand, if we put aside the detail of the separate wandering limbs in Empedocles, it is perhaps close enough to be called a paraphrase. Further, we now know from the new Strasbourg fragments that Lucretius did follow Empedocles' zoogony inasmuch as he translates part of it (or a very similar passage) at 2.1081 ff. (2.1081–3 ≈ a(ii) 26–8). There are differences between the two passages: Empedocles speaks of mountain-wandering beasts, the twin race of humans, root-bearing fields, and vines, while Lucretius replaces the last two items with scale-bearing herds, and birds. These are perhaps best explained by suggesting that Lucretius in fact translates a lost portion of Empedocles' zoogony, repeated with variations from a(ii) 26–8. This would make *squamigerum pecudes* and *corpora . . . volantum* Empedoclean phrases. The first at least is almost guaranteed because of Empedocles' fondness for pairing compound adjectives (I am grateful to David Sedley for this; see below on 864–6 *levisomna . . . lanigerae . . . pecudes*).

However, it is not clear to what degree Epicurus himself was influenced by Empedocles, or to what extent Lucretius has on his own initiative returned to Empedocles the better to present Epicurus' zoogony. The lengthy rebuttal of compound creatures from 878 ff. may suggest the latter, and indicate that Lucretius is conscious of the need to distance his account from Empedocles, having following him closely (see notes ad loc.). It is difficult to see that Epicurus would have incorporated Empedoclean phrasing as Lucretius does given his famous antipathy to poetry and myth as carriers of religion, or that he would have used the sort of mythologically charged language Lucretius does (Phld. *De Piet.* 225–31, and 2480–2509 Obbink; Phld. *De Poem.* 5 cols. 1–6 Mangoni; Diog. Laert. 10.121 (= fr. 1.121b2 and 4 Arr.);

Epicurus frs. 42 and 89 Arr.; see Clay, 1995, 3 ff., and Obbink, 1995, 189 ff.).

837–44. Apart from Plato's *Timaeus*, the only other detailed ancient scientific account of the origin of species extant is that of Empedocles. There is still considerable argument over Empedocles' cosmology, especially whether he has only one cosmogony and zoogony, or two. Martin and Primavesi (M&P 88 ff.) consider that the new fragments of Empedocles confirm the two-cosmogony theory, but others disagree (see M. F. Burnyeat's review in *TLS*, 28 May 1999, and for the original 'one cosmogony' argument, Solmsen, 1965). I assume that there are two cosmogonies described: one under Love and one under Strife.

In this double-cosmogony theory, Love combines the elements gradually to form the earth, air, sea, and sky, and during this process life is formed by the combination of separated limbs. Eventually all matter is combined completely into a sphere, life is destroyed, and we have an a-cosmic state. Then Strife takes over, separates out the elements again, and we have another cosmogony and zoogony in this phase as well. Eventually Strife separates the animals into their constituent limbs, and the world into its separate elements, and we have another a-cosmic state, until Love takes over again and recombines the elements and the limbs. Except for DK31 B62, all the extant zoogonic fragments are from the zoogony under Love. This gives rise to the problem of how the creatures described as arising under Love are related to those of this world, which seems from B62 to be under Strife (see Wright, 1995, 49 ff.; *contra* Burnyeat, 1999). I am inclined to take the two phases more as metaphorical devices for the explanation of different facets of the world as it is than as absolutely separate chronological stages. This technique is familiar to us from the two cosmogonies in Genesis 1 and 2, from the two myths of human origins in Hesiod's *Works and Days*, and is seen widely among various cosmologies throughout the world, in which different stories of creation, often contradictory, are told in parallel (see Eliade, 1963, 'The Structure of Myths', and Griffiths, 1998 on the technique in Amazonian cosmologies).

Accordingly, I see the creatures created under Love as ancestors of the animals we see today. The fact that human heads and limbs wander the primordial landscape under Love indicates that we are seeing an anthropogony as well as a zoogony, and that both occur at the same time and as part of the same process. DK31 B62, in which humans arise from the ground, drawn up by the *aether* as it separates out of the world under the influence of Strife, is very much a standard Presocratic view of the spontaneous generation of the first life, very similar to Lucretius' own, and seems to act in parallel with the compound creatures theory, each explaining different facets of development. By describing separation and combination as occurring in two distinct phases, Empedocles seems to have created this difficulty for himself. We would normally expect the two processes to be more nearly contemporaneous in cosmogony and zoogony: as in *DRN* 5.432 ff. elements separate out from dissimilar elements, and at the same time combine with like elements to form the masses that will become the four 'limbs' of the world. Then by a further process of separation, earth, air, sea, and sky are distinguished, and the world is born, and also all animal life. Thus as in Empedocles both separation and combination are creative processes, but unlike in Empedocles, they act together rather than separately. Compare Hes. *Theog.* 116 ff. (the origins of Epicurus' cosmological speculations according to Diog. Laert. 10.2, see Obbink, 1995, 189 ff.) and the other myths of cosmogony by separation collected in KRS 24 ff. Of scientific cosmogonies cf. Epicurus *Ep. Pyth* 89 ff.; Democritus DK68 A40; Leucippus DK67 A1; Anaximander DK12 A10 and Arist. *De Caelo* B13, 295^a7; Anaximenes DK13 A6; Parmenides (Aëtius 2.7.1); Anaxagoras DK59 A2 and A15; Archelaus (Hippol. *Ref.* 1.9.1–6); Diod. Sic. 1.7.1. For various arguments on Empedocles' cycle see O'Brien, 1969, 196–236; Wright, 1995, 211 ff.; M&P 54 ff.; Osborne, 1987; Bollack, 1965–9, iii/2. 410 ff.; Sorabji, 1980, 175–81; Blundell, 1986, 35 ff.

Empedocles introduces his zoogony(ies?) in Strasbourg fragment a(ii) 23–30:

> [δεί]ξω σοι καὶ ἀν' ὄσσ(ε) ἵνα μείζονι σώμ[ατι κύρει?,]
> [π]ρῶτον μὲν ξύνοδόν τε διάπτυξίν τ[ε γενέθλης?]
> ὅσ[σ]α τε νῦν ἔτι λοιπὰ πέλει τούτοιο τ[όκοιο?,]
> τοῦτο μὲν [ἂν] θηρῶν ὀριπλάγκτων ἀγ[ρότερ' εἴδη?,]
> τοῦτο δ' ἀν' ἀ[νθρώ]πων δίδυμον φύμα, [τοῦτο δ' ἀν' ἀγρῶν?]
> ῥιζοφόρων γέννημα καὶ ἀμπελοβάμ[ονα βότρυν?·]

ἐκ τῶν ἀψευδῆ κόμισαι φρενὶ δείγματα μ[ύθων·]
ὄψει γὰρ ξύνοδόν τε διάπτυξίν τε γενέθλη[ς].

I will show you to your eyes too, where they (i.e. the elements) find a larger body: first the coming together and the unfolding of the stock, and as many as are now remaining of this generation, on the one hand among the wild species of mountain-roaming beasts, and on the other hand the twofold offspring of men, and in the case of the produce of the root-bearing fields and of the cluster of grapes mounting on the vine. From these accounts convey to your mind unerring proofs: for you will see the coming together and unfolding of the stock (*fragment breaks off*). (Trans. M&P)

Fragments DK31 B57, B59, B60, and B61 describe the zoogony under Love, when the separate limbs of creatures are combined:

ἧι πολλαὶ μὲν κόρσαι ἀναύχενες ἐβλάστησαν,
γυμνοὶ δ' ἐπλάζοντο βραχίονες εὔνιδες ὤμων,
ὄμματά τ' οἶ(α) ἐπλανᾶτο πενητεύοντα μετώπων. (B57)

Here many heads sprang up without necks, bare arms were wandering without shoulders, and eyes needing foreheads strayed singly. (Trans. Wright)

αὐτὰρ ἐπεὶ κατὰ μεῖζον ἐμίσγετο δαίμονι δαίμων,
ταῦτά τε συμπίπτεσκον, ὅπηι συνέκυρσεν ἕκαστα,
ἄλλα τε πρὸς τοῖς πολλὰ διηνεκῆ ἐξεγένοντο. (B59)

But as god mingled further with god [i.e. the elements] they fell together as they chanced to meet each other, and many others in addition to these were continually arising. (Trans. Wright)

Cf. B60 (Plut. *Adv. Col.* 28.1123 B):

εἰλίποδ' ἀκριτόχειρα [καὶ] βουγενῆ ἀνδρόπρῳρα.

'Roll-walking creatures with hands not properly articulated or distinguishable' [and] 'ox-headed man-creatures' (Trans. Wright)

Πολλὰ μὲν ἀμφιπρόσωπα καὶ ἀμφίστερνα φύεσθαι,
βουγενῆ ἀνδρόπρωιρα, τὰ δ' ἔμπαλιν ἐξανατέλλειν
ἀνδροφυῆ βούκρανα, μεμειγμένα τῆι μὲν ἀπ' ἀνδρῶν
τῆι δὲ γυναικοφυῆ σκιεροῖς ἠσκημένα γυίοις. (B61)

Many creatures with a face and breasts on both sides were produced, man-faced bulls arose and again bull-headed men, (others) with male and female nature combined, and the bodies they had were dark. (Trans. Wright)

(Cf. Ovid's Empedoclean description of the Minotaur, *Tristia*

4.7.18, *Ars Am.* 2.24: 'semibovemque virum semivirumque bovem', see Rusten, 1982, and Hardie, 1995, 214.)

Fragment 71 gives Aphrodite as the force that combines the elements and so produces living creatures, seemingly including present-day ones:

εἰ δέ τί σοι περὶ τῶνδε λιπόξυλος ἔπλετο πίστις,
πῶς ὕδατος γαίης τε καὶ αἰθέρος ἠελίου τε
κιρναμένων εἴδη τε γενοίατο χροιά τε θνητῶν
τόσσ', ὅσα νῦν γεγάασι συναρμοσθέντ' Ἀφροδίτῃ (B71)

But if your belief about these things in any way lacked assurance, how, from the combining of water, earth, air and sun came the forms and colour of mortal things which have *now* arisen, fitted together by Aphrodite. (Trans. Wright)

Fragment 62 describes an anthropogony, seemingly under Strife:

νῦν δ' ἄγ', ὅπως ἀνδρῶν τε πολυκλαύτων τε γυναικῶν
ἐννυχίους ὅρπηκας ἀνήγαγε κρινόμενον πῦρ,
τῶνδε κλύ'· οὐ γὰρ μῦθος ἀπόσκοπος οὐδ' ἀδαήμων.
οὐλοφυεῖς μὲν πρῶτα τύποι χθονὸς ἐξανέτελλον,
ἀμφοτέρων ὕδατός τε καὶ εἴδεος αἶσαν ἔχοντες·
τοὺς μὲν πῦρ ἀνέπεμπε θέλον πρὸς ὁμοῖον ἱκέσθαι,
οὔτε τί πω μελέων ἐρατὸν δέμας ἐμφαίνοντας
οὔτ' ἐνοπὴν οἷόν τ' ἐπιχώριον ἀνδράσι γυῖον. (B62)

And now hear this—how fire, as it was being separated, brought up by night the shoots of men and pitiable women, for the account is to the point and well informed. First, whole-nature forms, having a share of both water and heat, sprang up from the earth; fire as it tended to reach its like, kept sending them up, when they did not as yet show the lovely shape of limbs, or voice or language native to man. (Trans. Wright)

Aristotle (*Physics* 198^{b}–199^{b}), and Simplicius (*in Phys. CAG* 9.371.33–372.11), explain that Empedocles' creatures are created by the random combination of disparate limbs. If the 'correct' limbs combine then the creature will survive and go on to found a species, but if the wrong combination occurs, then the creature will instantly perish, and so the adaptation of animals to their environment and role in life is explained: the creatures we see today are the descendants of the original animals 'correctly' assembled by chance. There is no need for any design or pattern in zoogony, whether divine or natural. Aristotle rejects Empedocles' theory because it relies upon the sort of chance not seen in nature, but he does seem to accept that Empedocles' system would, if it worked, account even for fine adaptations such as the configuration of the teeth.

Lucretius' system is of course different in that his maladapted creatures are formed at the atomic level rather than at the macroscopic level of whole limbs. We are not given an atomic explanation of zoogony here, but this may be supplied from Lucretius' exposition of Epicurean genetics at 2.700 ff., and from 5.416–31 where the creation of the world is described as the result of the random collisions of atoms, without any pre-existing pattern or organizing principle. Lucretius explicitly tells us this same process also produced the first life, 5.430–1: 'magnarum rerum fiunt exordia saepe | terrai maris et caeli *generisque animantum*'.

Empedocles views the original creation of animals and the formation of the embryo in the present day as fundamentally similar processes. The embryo is formed, as in the Hippocratic theory, by tiny preformed limbs coming together, contained in the seed of both parents. Unlike the original creation, however, the formation of embryos is not random, and is controlled by rules (e.g. Arist. *Gen. An.* 722^{b}17–30; Aëtius 5.1.8; Hippoc. *Nat. Puer.* 17 (vii.496.19–20). See Dean-Jones, 1996, 162 ff.; Sorabji, 1980, 176–7; Wright, 1995, 9–10 and 49 ff.; Gotthelf, 1987, 215–16; Balme on *Gen. An.* 722^{b}3 ff.). This perhaps makes it easier to understand the theory of original creation by the combination of limbs, since it is analogous to this pangenetic preformationist theory of embryology. This would work in a similar way to the *hieros gamos* myth of cosmic origins, in that human reproduction is the model for the birth of the universe, and so for the original creation of life, and corresponds to the traditional analogy between human birth, zoogony, and cosmogony found so frequently in Greek mythological and scientific thinking. (See Fowler, 2000*b*, 138 ff. on the *hieros gamos*; Furley, 1989, 229 ff., and further on 851 ff.)

Aside from this difference the two systems are significantly similar: life is formed randomly in a great burst of mutations in the beginning of the world, and these mutations are then 'selected' by extinction, to produce viable species well adapted to their environment. As I have argued above (see introduction to 837 ff.), Lucretius is not an evolutionist here, since he insists on the immutability of species, but this reliance on natural selection by extinctions has led to his wrongly being considered one. The same may be said of Empedocles. He likewise is not an evolutionist, since his expedient of accounting for adaptation by the matching and mismatching of limbs indicates he did not have recourse to the sort of metamorphic adaptation found in *Timaeus*, and he may be considered as one of Lucretius' anti-teleological forerunners (against this see Sedley, 1998, 18–21, and L&S ii. 64. In my review of Sedley (Campbell, 1999), I argued that Empedocles' use of a teleological explanation for the creation of the eye (DK31 B84 and 86), upon which Sedley relies, need only be seen as a didactic device, but I now accept that Empedocles may well have seen the creation of limbs and organs as purposive, while allowing no teleology in the formation of species. Cf. DK31 B96 on the creation of bones with Simplicius' comments. (See Introduction, 'The Creation and the Origin of Species'.)

For Lucretius, working within the context of the fixity of species guaranteed by sexual reproduction, all possible mutations occur in the spontaneous generation phase. In the standard Darwinian model species evolve by micro-mutations, caused by small genetic differences between parents being passed on to offspring in sexual reproduction. However, another modern model of evolution suggests that macro-mutations can also take place, and thus lead to far more rapid evolution of species. Gould (1985, 132–3) describes the arguments between Darwin and Huxley over the possibility of macro-mutations, also known as 'saltation', in which Huxley criticized Darwin for insisting *Natura non facit saltum*. In this model, large unpredictable mutations can produce 'hopeful monsters' that may just possibly be well adapted to their environment and may also be able to pass their advantageous genetic mutations on to offspring and so found a new species in one generation, instead of the very many generations needed for speciation in the micro-mutations model. The foremost modern exponent of this theory has been Richard Goldschmidt (1940, see Gould, 1985, 360–73, and Skelton, 1993, 499 ff.). It can be seen that the macro-mutation theory is somewhat closer to Lucretius' and Empedocles' ideas of wild mutations than is the traditional Darwinian micro-mutation model, in that the cause of mutations is not derived from the mechanics of sexual reproduction, but is entirely random and indeterminate, while the Darwinian model is still open to deterministic interpretation since it proceeds by, at least, determinable, progressive stages. Of course Lucretius is still a very long way from even the macro-mutations view of evolution, since all his mutations have already happened in the first spontaneously produced generation before the advent of sexual reproduction, and for him mutation at the genetic level is impossible since it is prevented by the mechanism of sexual reproduction itself (see below on 923–4).

837. multaque . . . portenta: as I have noted above, the only limit to the variety of creatures originally created was the limit on atomic combinations provided by the *foedera naturae*. Accordingly, the variety of *portenta* would be very large. Since there was no intelligence or design involved in their creation, these animals would not necessarily have any attributes that would enable them to survive or even live for more than a few moments. Therefore, L.'s list of their inadequacies for survival that follows is not exhaustive, as he signals in 845 *cetera de genere hoc*. Empedocles similarly describes 'countless types of mortal creatures' pouring forth from the earth in the zoogony under Love, DK31 B35.7 and 16: *χεῖτ' ἔθνεα μυρία θνητῶν*, and Plut. *Adv. Col.* 28.1123 B (DK31 B60) tells us there are many other types of Empedoclean prodigies, using similar language to L.'s *portenta*: *τοῖς Ἐμπεδοκλέους ἐοικότα τεράσμασιν*.

Portenta recalls the Roman view of such monstrous creatures born in their own day as portents of disaster or divine disfavour. Of course for L., as an Epicurean, the will of the gods can have no consequences for humans or the world (1.44–9, 2.646–51, 5.76–81, 5.148; *Ep. Hdt.* 76–7 and *KΔ*1) nor is any form of divination possible (Diog. Laert. 10.135 = fr. 15 Arr.; Diogenes of Oinoanda frs. 23–4, 53–4 Smith (probably against the Stoics, see Smith, 1993, 138–9); Cic. *ND* 1.55–6). But divination by monstrous prodigies and portents was a part of later Stoic theory (Cic. *ND* 2.7.4 ff., 2.162 ff., 2.167 ff., and refuted by the Sceptic Cotta *ND* 3.5 and 3.11 ff., *De Fato* e.g. 12–15 against Chrysippus, *Div.* e.g. 1.82–3 (= *SVF* 2.1192), see L&S 42C–E). It was also a popular superstition reported by Livy 23.31, 27.37, 32.1 and 9; Pliny *NH* 7.3; Lucan 1.522–83; and Tac. *Ann.* 12.64

(Blundell, 1986, 91), and so the description of these unsuccessful creatures as *portenta* serves the useful function of tapping into popular superstition that monstrous births indicate the will of the gods, to aid his argument that there was no divine involvement in creation. Compare L.'s use of teleological language at 784, 786, 805, 810 and the modern use of such teleological-sounding terms as 'the blind watchmaker' and 'the selfish gene' by Richard Dawkins (1976, and 1986) in anti-teleological arguments, and of course Darwin's famous 'natural selection' has a teleological ring to it which has caused many misunderstandings, leading Darwin to concede: 'I must be a very bad explainer. I suppose "natural selection" was a bad term' (Dennett, 1995, 73. See also Gould and Lewontin, 1979, and Mayr, 1961). Further, L., in 5.195–234, relies upon the imperfections of the world in rejecting teleological explanations for its creation, and so here also the *portenta*, the imperfect creations of the earth, guarantee the random nature of the creation of life without divine providence.

These *portenta* are clearly different from the impossible 'double natured' creatures of 878–906 which never existed at any time (but cf. *portenta* used of compound creatures in 2.701, and see below on 878). These creatures are not deviations from a norm since no norm for creatures could exist until sexual reproduction took over from spontaneous generation, when species would begin to breed true. They are also quite different from Empedocles' compound creatures, in that there is no inter-species mingling of limbs.

tum . . . etiam: as with *tum* in 805 (see note there, and West, 1964), my preferred meaning here is 'then', i.e. 'at that time' rather than 'next'. That is, the earth created the *portenta* at the same time as the viable creatures rather than in a separate stage of creation. With *etiam* that is: 'monsters as well as (viable creatures)' rather than 'the earth tried also to create monsters', which would suggest a separate act of creation. Thus, this is a description of the scene of the original creation of all creatures, but details only the *portenta*. Since the creation of life is random, an occasional viable creature can be assumed to arise amongst the many *portenta*. This is well illustrated by M. Burghers' frontispiece to Creech's translation of L. (5th edn., 1700), in which we see an 'Empedoclean' man-faced sheep-creature and a human emerging from the ground at the same time. But of course L.'s zoogony has no place for compound creatures. Schrijvers (1999, 17) considers that L. is pointing out that such malformations are not against nature, comparing Aristotle *Physics* 199^{b}1 ff. in similar vein, and that this makes an anti-religious point. Empedocles and the Hippocratics similarly explain birth malformations in a mechanistic way (Empedocles DK31 A81; cf. Diels, *Doxographici Graeci*, 420–1; Sorabji, 1980, 176–7). Given the context of birth from the earth in analogy with human birth, it would seem inevitable that this idea would be suggested to a contemporary reader by the terms *portenta* and *monstra* (cf. Greek *τέρας* with Stein, 1909) with their associations with divination by unusual births and occurrences in their own day (see note above). However, despite the diachronic analogy, for both L. and Empedocles sexual reproduction imposes limits and regularity on modern births (2.700 ff., DK31 A81), lacking from the original zoogony, and it is thus that the *portenta* were originally possible.

838. mira facie membrisque coorta: just as with *portenta* L. uses the very concept he is attempting to remove from zoogony: wonder (cf. 5.83, see above on 799). Cf. Empedocles DK31 B35.16–17: *ἔθνεα μυρία θνητῶν,* | *παντοίαις ἰδέῃσιν ἀρηρότα, θαῦμα ἰδέσθαι*. Both writers, with this motif, appropriate wonder and situate it within their anti-teleological systems: we no longer gaze amazed from without, but view calmly the amazing randomness of nature.

839. The line is garbled in terms of both sense and metre in manuscripts O and Q: 'androgynem inter utras nec utramque (ut utrumque O) remotum'. But Lachmann's correction (revised by Munro), which I print here, gives at least a reasonable meaning. It seems impossible, however, to emend the line to produce an elegant hexameter, with its choppy repetition of 'utr' and 'um' sounds, and as Wakefield says ad loc. the awkwardness that led to its corruption may well serve as syntactical onomatopoeia: an ill-made line illustrating the ill-made creatures (cf. 881 below). Ovid *Met.* 4.379 echoes this line: 'nec puer ut possit, neutrumque et utrumque videtur', of the blending of Salmacis and Hermaphroditus, but smooths it out somewhat to stress the

unity of male and female, while still keeping the illustration of gender polarity.

Here we have an echo of Empedocles, who also has hermaphrodites among his randomly constructed man-faced ox-creatures and other monsters, DK31 B61.3–4: μεμειγμένα τῆι μὲν ἀπ' ἀνδρῶν | τῆι δὲ γυναικοφυῆ. Aëtius' 5.19.5 summary of the four stages of generation suggests that Empedocles discussed sexual reproduction at this point (see Wright, 1995, 80), and so both L. and Empedocles put these hermaphrodites in a similar place in their zoogonies, among the entirely unviable creatures that will die out very quickly, when we could expect them to occupy a separate class of their own. Here, as in Empedocles, sexual identity is created randomly by spontaneous generation. Masculinity, femininity, and sexual reproduction itself, are all chance occurrences in a way quite at odds with ideas contained in myths such as that of Pandora, who is created as the first woman by Hephaistos, and also that of Erichthonios, and in Plato's *Timaeus* (e.g. 42a ff., see DuBois, 1988, 169 ff.), and Stoic Providentialism (Cic. *ND* 2.128 with Pease ad loc.). On Greek ideas of sexual identity see Loraux, 1993, 'On the Race of Women', and of the extensive bibliography on hermaphroditism see esp. Fowler, 2000*b*, 157 ff.; Nagel, 1984; Viarre, 1985; Nugent, 1990; Robinson, 1999; Ajootian, 1997; Brisson, 1997.

840. In 4.823–57, L. argues against the teleological creation of the senses and limbs: we were not given legs to enable us to walk, but having legs, we learned to make use of them. Here, as proof of the random non-teleological creation of feet and hands, some creatures are born without them. Plato in *Timaeus* argues that creatures and their attributes were designed purposively by the gods (44d ff., 74a ff., cf. *Prt.* 320d–321b), and famously, Aristotle considered there is a purpose to the possession of hands, *De Part. An.* 686^{a}26–687^{a}19: 'Man instead of forelegs . . . has hands *because* he is the most intelligent of the animals' (see Blundell, 1986, 77). In Hellenistic philosophy, the Stoics were the arch-teleologists and providentialists (L&S 13E–J, 54A–U).

Munro claims that the genitives *pedum* and *manuum* are unusual after *orba* and *viduata*, and derives the form from Empedocles' description of separated wandering arms in his zoogony, DK31 B57: βραχίονες εὔνιδες ὤμων (cf. Wakefield ad loc.). Bailey ad loc. notes, however, that L. is fond of this genitive of separation (cf. 1.1041, 2.843, 3.821, 6.1065, etc.), and that it is found in Enn. *Ann.* 203 and later in Hor. *Carm.* 3.27.69, concluding that it is not, as often claimed, a Grecism. However, it seems possible that Empedocles is the source of the device for both Ennius and L., especially given Ennius' links with Pythagoreanism (see Skutsch, 1968, 8 ff., 151 ff., and Livrea, 1998). Verg. *G.* 4.310, on the spontaneous generation of bees: '*trunca pedum* primo mox et stridentia pinnis', imitates Lucretian usage, pointedly in the context (cf. Gale, 2000, 230).

841. As in the previous line, L. gives proof of the non-teleological nature of creation, showing that the creation of life was random and without intelligent design.

It may be preferable to see two categories of *portenta* here, rather than one: those unable to speak, and those unable to see (Schrijvers, 1999, 20). Lack of ability to communicate would then be a cause of extinction, and this separation of sight from speech would match the list of faculties in the anti-teleological argument at 4.823 ff. In the Epicurean theory, humans, at least, would have a certain ability to produce words as soon as they arose from the ground (see below on 1028 ff.), and this communicative ability would be useful for their survival, as it is later on in the first societies (see on 1011–27 below).

Creatures are born with eyes not so that they may see, but are able to see because they have eyes, as in 4.825–6: 'lumina ne facias oculorum creata prospicere ut possimus'. This stance may not seem consistent with the argument on the 'natural' origins of language in 5.1028–90 where L. claims that functions are in some way innate in animals and that form develops later, as in the description at 1034–5 of the young bullock butting even before his horns have grown, but the ideas may be assimilated (see below ad loc.).

Empedocles may seem to take a different view, describing the eye being created purposively by Aphrodite, the personification of the combining force of the universe (DK 31 B84, cf. B96 on the creation of bones with Simplicius' comments). L. here denies that function precedes form, and this would be the fundamental Epicurean approach, since there can be no overarching transcendent law of nature existing before the atomic collisions and combinations that lead to the formation of life. For the Stoics the perfect adaptation of the senses for their purposes was proof of the providential care of nature for human beings (see e.g. Cicero *ND* 2.144 ff. with Pease ad loc., and L&S i. 278–9).

842. The effect of the adhesion of the limbs is to render these creatures limbless for practical purposes, since they could not use or move them. Thus this detail could well have an Empedoclean origin. Bollack (1965–9, iii/2, 419–21) compares Empedocles DK31 B60 (Plut. *Adv. Col.* 28.1123 B):

> *εἰλίποδ' ἀκριτόχειρα [καὶ] βουγενῆ ἀνδρόπρῳρα.*
>
> 'Roll-walking creatures with hands not properly articulated or distinguishable' [and] 'ox-headed man-creatures' (Trans. Wright)

Both Bollack and Wright, on B60, consider that *ἀκριτόχειρος* should be 'with hands not properly articulated or distinguishable' rather than, as in LSJ, 'with countless hands', and the 'roll-walking creatures' (*εἰλίποδ'*) certainly suggest just such creatures of limited mobility as L. describes here. David Sedley on the other hand, in correspondence with me, points out *εἰλίπους* is an epithet of oxen (cf. *Il.* 6.424, 9.466) and sees here another example of a compound species, perhaps of oxen and bears ('with dense (or undifferentiated) hands').

843–4. This list of disabilities refutes the Stoic view given in Cic. *ND* 2.33–4 that the providential care of the divine principle for creatures is shown by nature granting them the ability to feed themselves and increase, sense and motion, the ability to seek health-giving things and to avoid dangers (see Pease ad loc. and compare Sen. *Ep. Moral.* 121.24).

845–6. See above on 837. A denial of the adage of Aristotle and Galen: *οὐδὲν ἡ φύσις ἐργάζεται μάτην*, 'nature does nothing in vain', (e.g. Arist. *Cael.* $271^{a}33$, *Gen. An.* 741B4; Gal. *De Us. Part.* 3.494.1, and 4.240.19. See Schrijvers, 1999, 71; Robin ad loc.; see Bonitz s.v. *φύσις* $836^{b}29$ ff.). Earth produces random creatures to no avail since *natura*, here 'physical necessity' or simply the physical make-up of the creatures, prevents them surviving. Again the earth and nature are personified and described as if acting in a purposive way (compare 837–8 above, d see on 811), usefully tapping into the teleological notions of ristotle and Galen, and turning them against themselves.

7–8. L. uses the phrase 'cupitum aetatis tangere florem' at 770, also of the reaching of maturity, and a similar phrase at 564. The 'flower of youth' metaphor is common (*TLL* 1127.51 ff.), but here, with the juxtaposition of Venus, con- ues the creation of life in springtime motif from the previous ction. Surely we see in *nec iungi per Veneris res* an ironic refer- ce to Empedocles' Aphrodite joining the limbs of creatures at eir creation (e.g. DK31 B71: συναρμοσθέντ' Ἀφροδίτῃ). This, ken straight, is also in line with the traditional analogy between smogony, zoogony, sexual reproduction, and embryology ee Furley, 1989, 229 ff., and above on 799–800). A similar mpedoclean image is found at 5.962 'et Venus in silvis iungebat rpora amantum' (see below).

Lines 849–854

Here L. delineates the two fundamental requirements for survival and reasons for extinctions of *portenta*: death of individual creatures through starvation (*pabula primum ut sint*), i.e. the need for food, and their inability to breed (*genitalia . . . uterque*), both of which prevented them from founding and propagating species. This explains why we do not (normally) see such creatures today. In Epicurean physics there is no obvious reason except for this why *portenta* could not breed and found a species. Indeed, in this way we are all descendants of *portenta*, but of ones successful in competition, since, as I have noted above (introductory note to 837 ff.), the *portenta* are not variations from a norm, since no norm could exist until sexual reproduction took over from spontaneous generation and fixed creatures into discrete species. Against the idea of norms in creation, and of nature working out an expression of an underlying pattern in evolution, see Gould, 1985, 199–211 'The Rule of Five', who argues that even universal features such as pentadactyly do not signify that the number five has any teleological significance.

The interpretation of 849–54 has given a good deal of difficulty to many commentators. Chilton (1980) considers that good sense can be made of these lines if we do not punctuate between *possit* and *habere* in 853, thus avoiding a strong sense break in the fifth foot of a line, that Townend (1969, 338) has shown is very unlikely in L. Thus *possit* would govern both *coniungi* and *habere*, and we would have as the condition for founding a species the possession of the correct genitalia. However, this reading does involve an awkward asyndeton in the fifth foot of 853. Lachmann avoids the sense break between *possit* and *habere* by emending to '*avere* | mutua*que insinuent* inter se gaudia uterque'. This also avoids the asyndeton by giving us *que* and changes the sense completely, giving:

> *and* (thirdly) that the female is able *to be eager* to be joined with males and that both may *introduce* mutual joys to one another.

This is attractive on interpretative grounds, stressing female desire as an essential behavioural character (see on 853–4 below), but is perhaps moving too far from the paradosis. Winterbottom (2000) gives a neater reading without altering the text, taking *habere* in 853 as governing everything after *pabula primum ut sint*, giving:

> Firstly that *there is* food, then [secondly] that *they have* a way by which the generative seeds can trickle through the limbs when the members have relaxed, and [thirdly] so that females may be able to be joined to males, that *they have* [*the physical means*] *whereby* they can both exchange mutual joys between themselves.

849. rebus: 'in creatures'. L. views living creatures as a part of the world. They arise as a function of the cosmogony, as is traditional in Greek scientific cosmology (Blundell, 1986, 67; Furley, 1989, 229 ff.). Compare 5.431–2 on the creation of the world:

magnarum *rerum* fiunt exordia saepe
terrai maris et caeli *generisque animantum*

Pl. *Tim.* 41b subverts the idea, and has the birth of the stars as part of the zoogony (see Campbell, 2000).

850. See below on 856 and 1027.

851. pabula primum ut sint: this condition corresponds with the inability of *portenta* to eat or find food in 841, and 844, but it also serves to sum up the inability of these creatures to support themselves in general: 840–3, *nec vitare malum* 844, and again follows on specifically from 848 *nec repirere cibum.*

In the context there is perhaps a reference here to the relationship between food intake and the production of the generative seed, which L. gives in 2.661–729, where only certain atoms may be taken up from food by each species. Thus the matter of each species retains its integrity, and only that species' own pattern of atomic combinations may be passed on to their offspring, preserving the integrity of species descent. In 4.1260 ff. L. describes the effect of diet upon the thickness or thinness of seed, where incompatibility of thickness of male and female seeds can lead to problems of conception (see Brown ad loc. and below on 897–8). We may assume, however, that diet cannot effect a change in the fundamental genetic make-up of the seed (2.661–8).

851–2. genitalia deinde per artus | semina qua possint membris manare remissis: in the Hippocratic pangenetic theory, which L. shares, the seed is drawn from all over the body, travels *through* the limbs *to* the genitals, and both parents contribute seed to an embryo, (cf. Hippoc. *Genit.* 4 (vii.4747.16–18); *DRN* 4.1041 ff. with Brown ad loc., cf. fr. 161 Arr. See Dean-Jones, 1996, 155 ff.; Schrijvers, 1999, 21–2; and below on 890). L. describes the limbs of lovers during sex in 4.1113–14:

> usque adeo cupide in Veneris compagibus haerent
> *membra* voluptatis dum vi *labefacta liquescunt.*

This is a description of the state of the whole body before orgasm, which is described in the lines following, 4.1115–16:

> tandem ubi se erupit *nervis* collecta cupido
> parva fit ardoris violenti pausa parumper.

Therefore *membris manare remissis* here would describe the travelling of seed through the limbs to the genitals. It has generally been read as a description of the ejaculation of seed, but *manare* would seem more gentle a word than L. uses elsewhere, cf. 4.1035 *profundant*, 4.1046 *eicere*, 4.1115 *erupit*, and 4.1056 *iacere*, and I am unable to see a parallel use of *manare* either in *TLL* 8.319.76 ff., or in Adams' *Latin Sexual Vocabulary*. Schrijvers (1999, 21–2) rejects the idea that *membris . . . remissis* describes orgasm, but unnecessarily adopts Lachmann's *remissa* for *remissis* (i.e. *semina* . . . *remissa*), arguing that *membris* . . . *remissis* would have to describe the state of the body after orgasm. However, in Hippocratic thinking sexual excitement causes an internal liquefaction of the limbs before orgasm, described here by *membris* . . . *remissis*, and this allows the passage of seed through the limbs to the genitals (4.1114 '*membra* voluptatis dum vi *labefacta liquescunt*', cf. Hippoc. *Genit.* 3; Dean-Jones, 1996, 154 ff.). Note that *membris* need not refer to genitals, as is often assumed: in 4.1114–15 L. is careful to distinguish *membra* as 'limbs' by using *nervis* for genitals, and here possession of the correct genitalia would be covered by 853–4.

853–4. This is the third condition for creatures to be able to found a species: according to Winterbottom's reading: 'and, so that women may be joined to men, that they each *have the means by which* they may exchange mutual joys between themselves', i.e. that they both have the correct sort of genitalia.

Schrijvers (1999, 22) sees the *mutua* . . . *gaudia* as a reference to orgasm, but *mutua* . . . *voluptas* 4.1201 and *communi' voluptas* 4.1208 are used in the passage on the necessity for mutual *pleasure* in sex. Lachmann's emendation '*avere* | mutua*que insinuent*' for 'habere | mutua qui metuent' of OQ should be rejected as being too far from the manuscript readings. However, Munro ad loc. rejects it because 'the wish of the female is not important', and Chilton (1980, 379) comments 'the introduction of female desire seems completely out of place'. Lachmann was quite right to stress the importance of mutual desire in these lines, however, as L. shows in 4.1192–1208 (see Brown ad loc.). In 5.962–5 L. describes the sexual behaviour of early humans in the 'natural' phase of their existence, and here also mutual desire is crucial to mating, and is placed first before rape and prostitution. Cicero presents the Stoic Balbus using an argument very similar to 849–54, but in favour of divine providence, *ND* 2.128:

> Quid loquar quanta ratio in bestiis ad perpetuam conservationem earum generis appareat? Nam *primum* aliae *mares* aliae *feminae* sunt, quod perpetuitatis causa machinata natura est, *deinde* partes corporis et ad procreandum et ad concipiendum aptissimae, *et in mare et in femina commiscendorum mirae libidines.*

Here in 853–4 we could expect a similar stress on the necessity for women to want to have sex with men as a behavioural characteristic crucial to the founding of a species. L. says simply at 4.1197–1200 that without mutual desire females would not consent to sex. However, the Hippocratics (cf. Hippoc. *Genit.* 4 (vii.4747.16–18); Dean-Jones, 1996, 155 ff.), who share a pangenetic view of embryology with L., consider that female arousal is necessary for conception itself, since both male and female produce seed in the same way, and both ejaculate seed; the male externally, and the female internally, cf. 4.1215–16:

> *semina* cum Veneris stimulis excita per artus
> *obvia conflixit* conspirans *mutuus ardor*

Further, in 897–8 L., among various explanations based on physiological incompatibility, gives a very similar explanation for the impossibility of Centaurs (see on 897 ff. below):

> nec *simili Venere ardescunt* nec moribus unis
> conveniunt, neque sunt *eadem iucunda per artus*

L.'s claim at 4.1268 that wives have no need of pleasurable movements may seem to undermine this, but can be explained with reference to the Hippocratic theory that because women are of a moister constitution than men, enough pleasure will be created by sex for women to release their seed, even without their knowing it (!). Therefore, the Hippocratic ideas of female sexual pleasure and female ejaculation are not orgasmic: tellingly no mention is made of a link between clitoral stimulation and orgasm in the discussions of the release of female seed (Hippoc. *Genit.* 4 (vii.4747.14–18); Dean-Jones, 1996, 78 ff.).

Lines 855–877: adaptation in the struggle for life

L. does not rely upon the first kind of extinctions alone to account for adaptation, and here we are given a second explanation of adaptation: now of whole species. We may assume that these creatures are viable, but that they die out because they do not have particular physiological or behavioural characteristics to enable them to survive in a competitive struggle for life. For the relationship between this and Darwin's theory, and why we should not view this as an evolutionary theory, see Introduction.

L. also includes, as we should expect in an Epicurean account, survival by co-operation, crucial to the Epicurean view of the evolution of society (see below on 5.1011–27).

In 837–54, L. has already removed maladapted creatures, and explained the formation of species. However, it seems clear that the extinctions of the *portenta* would account only for broad adaptations, such as having usable limbs, functioning reproductive systems, and so forth. Creatures unviable in themselves because of some fundamental flaw in their make-up would die out, but fine adaptations such as the positioning of the eyes on the front of the head, number of eyes, number of digits on a hand, and teeth being sharp at the front of the mouth and blunt at the back (cf. Arist. *Phys.* 2.8 198^{b}16–34), and so on, could not be accounted for in this way. Animals with a reversed tooth configuration could still eat, and having eyes at the back of the head or seven digits would not, on their own, prevent a creature from surviving (see Cic. *ND* 2.144 ff. for the Stoic use of the 'design' of the eye as proof of Providence; and *ND* 2.133–4; Arist. *De Part. An.* 661^{b}7; Xen. *Mem.* 1.4 for the configuration of the teeth as evidence of design in nature). Accordingly, L. introduces extinction by competition. Animals with reversed teeth would not be as successful as those with 'normal' teeth, and so would become extinct in competition for food resources, and so, the fine adaptation of animals to their environment is explained. To use L.'s examples: lions (or creatures who compete with lions) with lesser strength would die out and so the lion's great strength is explained. Creatures with lesser speed than deer would be caught and eaten, and so the speed of the deer is explained. We may imagine a great range of different creatures with different attributes in L.'s early world, but only those with the 'correct' attributes and adaptations (the species we see today) would survive. All the others have become extinct. The seeming providential design of animals, fitting them perfectly for their role in life, is refuted, and replaced by a non-teleological process of the interaction of chance and necessity.

We cannot know whether Empedocles expanded on his theory with a second round of extinctions by competition and thus accounted for fine adaptations, although M&P fr. a(ii) 25 'and as many as are now remaining of this generation' may suggest it; neither Aristotle nor Simplicius mentions it. But adaptation by natural selection in a struggle for life is not unique to L. in ancient literature. It is found also in the Hippocratic *On Ancient Medicine* 3.26, where the writer argues that the first humans cannot have been healthy on their wild diet of grasses and roots, and that the majority of them, the weaker, died out leaving only the stronger to pass on their tough constitutions. So we have progressively toughened and been adapted to our environment by extinctions (see on 925 ff. below).

We are given four reasons for species' ability to avoid extinctions: cunning, strength, speed, and symbiosis. This is similar to the evolutionist Søren Løvtrup's (1987, 384) anti-Darwinian triplet, intended to replace the single 'survival of the fittest' adaptive mechanism:

1. 'The survival of the dominant (in the struggle for life)', cf. *virtus* 858
2. 'The survival of the cunning (enough to avoid the struggle for life)', cf. *dolus* 858
3. 'The survival of the lucky (enough to avoid the struggle for life)', cf. *mobilitas* 858, and 860–1.

In L., the focus moves from competition (Løvtrup 1) to competition avoidance (Løvtrup 2 and 3), to co-operation (≈ Løvtrup 3) as a positive behavioural attribute in the preservation of life, as we should expect in an Epicurean account of the development of species. Those creatures lucky enough to have arisen by spontaneous generation randomly from the earth with certain characteristics that made them useful to others, gain a positive advantage and *avoid* the competition that otherwise could have destroyed them. As the closeness of L.'s mechanism to that of Løvtrup shows, L.'s view of the place of competition is quite different from that of traditional Darwinists. They tend to see competition as an improving process working upon the micro-mutations of each generation, 'selecting' those 'fittest' to survive in the constant 'struggle for life'. (See Gould, 1985, 443; Van Valen, 1974.) This idea of struggle as an improving process has often been used in sociobiology and social Darwinism, economic, political, and social theories, to justify brutal and exploitative policies, especially, but by no means exclusively, in Fascism. However, critics of Darwinism since Peter Kropotkin (1902) argue that nature exhibits at least as much co-operation as competition, and that the Darwinian stress on competition as evolution's driving force is misplaced. Further, co-operation and altruistic behaviour have now been shown to be powerful adaptive strategies (see further below on 1011–27; Axelrod, 1984 and 2000; Matt Ridley, 1996; Badcock, 1994, 48 ff.).

L. balances the 'struggle for life' idea, needed to explain close adaptations, with the obverse side of the argument on adaptation by extinctions: survival of the lucky, the cunning, and the co-operative. Survival by co-operation and avoidance of competition is given 13 lines (860–1, 864–74). Perhaps because of our Darwinian preconceptions, however, it is the competitive 'survival of the fittest' idea that has always been noticed and commented upon, while extinction avoidance through co-operation has, for the most part, been passed over in silence (e.g. by Bailey, 1947, 1464–7; Costa, 1984, 102–5; Munro, 1864, ii. 354–5; L&S i. 64–5; Blundell, 1986, 91–3; Lowenstein, 1965, 13 (in Dudley, 1965)).

Plato *Prt.* 320d–321b gives a view of adaptation by divine providence, in which species survival similarly is guaranteed by the possession of certain characters, but these are granted purposively by Epimetheus, rather than arising by chance. (For various analyses of the myth see Sihvola, 1989, 100; Guthrie, 1957, 84 ff. and 1971, 63 ff.; Havelock, 1957, 87 ff.; Nussbaum, 1986*a*, 100–1.) These characters are granted specifically in order to avoid extinction of any species. This suggests strongly that Plato was aware of the argument for adaptation by extinctions, and wished to avoid it. It seems possible that Plato is inverting a Presocratic argument on adaptation, or perhaps Protagoras' own.

The Stoics use symbiosis, the specific point L. brings forward to explain extinction avoidance, as an example of the providential ordering of nature (Cicero *ND* 2.130 with Pease ad loc.). Using the argument from design, they argue that every relationship must be the product of an active principle in nature that acts to fulfil the purpose which is, of course, expressed in perfection by the order and hierarchy of the world as we see it. Thus, Chrysippus reached an opposite position to that of the Epicureans: that animals exist for the sake of serving humans (Porph. *De Abst.* 3.20.1–3 = *SVF* 2.1152, L&S i. 329). Similarly, Cicero has the Stoic Balbus summing up the Stoic view of the divinely ordered relationship between animals and humans, *ND* 2.133:

> Ita fit credibile deorum et hominum causa factum esse mundum quaeque in eo mundo sint omnia.

The Epicurean argument against this teleological view of the world created for humans is given by L. in 5.195–234.

In evolutionary terms, this sort of symbiotic adaptation in which species adapt reciprocally is referred to as co-evolution (see Skelton, 1993, 340–1). Plainly, L.'s system cannot envisage *new* species evolving to live in such a relationship, but the ideas are similar: species can evolve towards a symbiotic relationship, but without crossing species boundaries.

The necessity for extinctions is also traditionally part of the argument on the destructibility of the world (Sedley, 1998, 166 ff.). Theophrastus (fr. 184 FHS&G) criticizes various arguments of those who claim the world is destructible. Among them is the argument that whole species of animals have perished. This would imply that if living creatures are destructible *en masse*, then the world can hardly be immortal. Theophrastus counters that such extinctions could just as well be accounted for by periodic disasters such as universal floods and the *ekpyrosis* of the world, which would remove large numbers of creatures, but leave some to carry on and repopulate the world, thus giving the appearance of a new, young world to what is in fact eternal. This explains L.'s rejection of the flood and disaster theories of mass extinctions at 5.338 ff. Here the reference is to extinctions of individual species, rather than mass extinctions caused by sudden disasters or floods (for the latter see Caduff, 1986).

Lines 855–861

855. saecla: L. uses *saecla* interchangeably with, and as the plural of, *genus*, since *genera* is metrically awkward in hexameters. Compare the hendiadys *genus acre leonum saevaque saecla* 862, and also the various different phrases for human and/or animal species, 5.431 *generisque animantum*, 5.925 *genus humanum*, 5.988 *mortalia saecla* (of humans, see above on 805), 5.982 *saecla ferarum*.

In the context of the origin of species we could reasonably expect L. to attempt a definition of species, but this is not humans: thus a step further away from competition and towards co-operation as a survival strategy (for domestication see below on 864 ff.). Here the usefulness of animals to humans is accidental rather than, as in Stoic theory, providential, and the reason for the animal's very existence, Plut. *On Stoic Self-Contradictions* 1044 D (= *SVF* 2.1163; L&S 54O):

> *ἐν μὲν οὖν τῷ πέμπτῳ Περὶ φύσεως, εἰπὼν ὅτι οἱ κόρεις εὐχπήστως ἐξυπνίζουσιν ἡμᾶς καὶ οἱ μύες ἐπιστρέφουσιν ἡμᾶς μὴ ἀμελῶς ἕκαστα τιθέναι* . . .
>
> In 'On Nature' book five he [Chrysippus] says that bed bugs are useful for waking us, that mice encourage us not to be untidy . . . (Trans. L&S)

So, this account of symbiosis taps into teleological notions of the relationship between humans and animals, while arguing quite the opposite. In the Plutarch extract quoted above Chrysippus is able to find a purpose in human service even for pests, and notoriously even considers that the pig exists only as a source of bacon (Porph. *De Abst.* 3.20.1 (inc. *SVF* 21152 = L&S 54P)); compare L.'s position on pests and diseases in the argument against the earth being created for humans' sake at 5.218–21.

The similarity of the phrasing here and in 1019–26 reflects the conceptual closeness of the two passages, cf. *commendarunt* 1021 and *perducere saecla propago* 1026: the mechanism of the first domestication of animals, by the recognition of their usefulness, which leads to humans protecting them, is essentially the same as that of the formation of the first societies and of justice (for the use of *commendare* in both passages see on 1021 below). People recognized the *usefulness* of refraining from harming one another and of protecting the weak, and here they recognized the usefulness of animals, and the benefits of protecting them (see Schrijvers, 1999, 104 ff., and below on 1011–27).

The Epicurean view of the prehistoric relationship between humans and animals is given by Epicurus in *KΔ* 32, and by Hermarchus fr. 34 LA (in Porph. *De Abst.* 1.101 ff. = L&S 22M and N; see further on 966 ff. and 1011 ff.). Hermarchus discusses the preservation of domestic animals and the destruction of wild animals, in terms of the Epicurean theory of justice. In his presentation, the preservation of domestic animals does not have quite the same basis as refraining from doing harm to other humans: we may enter into reciprocal friendship pacts with other people since they possess reason, but this is not the case with animals. Animals were (and are) preserved for the sake of their utility, as are people, but the utility is not described as mutual: the benefits to the animals are not considered. This is subtly different from Epicurus' account in *KΔ* 32 where it is the ability to make contracts, rather than the possession of reason, that determines whether reciprocal friendship pacts may be entered into. This would seem to include domestic animals in the theory of justice, and take account of the benefit to the animals themselves (see L&S i. 135; Blickman, 1989, 168; Müller, 1972, 124 ff.; Vander Waerdt, 1988; Campbell, 2002*a*). We must allow for bias in Porphyry's report, but L. here would seem to be closer to Epicurus than is Hermarchus, and describes the original domestication of animals in terms of mutual benefits, in a very similar way to the making of friendship pacts between humans in 1011–27.

861. commendata . . . tutelae tradita nostrae: see below on 867.

Lines 862–870: L. expands and explains 855–61

1. Lines 862–863

Similar behavioural characters are also attributed to lions and deer at 3.296 ff., where the difference in their behaviours is explained by the different proportions of cold and heat in their souls, and in 3.741–7, L. uses the same heritable characters in his arguments against the immortality of the soul (Schrijvers, 1999, 51–4). Schrijvers concludes that L. takes this list of characters from Aristotle *Hist. An.* 8.1588.16 ff. where a very similar list is found. However, it may well be that this is a traditional list of characters. Compare a Stoic use in the argument for adaptation by divine providence, Cic. *ND* 2.123:

> At quibus bestiis erat is cibus ut alius generis bestiis vescerentur, *aut vires natura dedit aut celeritatem.* Data est quibusdam etiam *machinatio quaedam atque sollertia,* ut in araneolis aliae quasi rete texunt, ut si quid inhaeserit conficiant . . .

Two of these, strength and speed, also appear in Pl. *Prt.* 320e, and, interestingly, Darwin, although he seems ignorant of ancient theories, chooses these same three animals and attributes nowhere else (Bailey ad loc.), but with *lanigerae* . . . *pecudes* gives a pairing of compound adjectives, which is rare in L. even within three lines (i.e. 1.3, 2.1081–3, and here). Pairing of compound adjectives is, however, a characteristic feature of Empedocles (Sedley, 1998, 24–5, e.g. DK31 B20.6–7, B21.11–12, B40, B60–1, B76.1–2). The other two occurrences in *DRN* are probably Empedoclean: from the new fragments, the technique at 2.1081–3 can now clearly be seen to be based on an Empedoclean original, Strasbourg fr. a(ii) 26–8 M&P:

> τοῦτο μὲν [ἂν] θηρῶν ὀριπλάγκτων ἀγ[ρότερ’ εἴδη?,]
> τοῦτο δ’ ἀν’ ἀ[νθρώπ]ων δίδυμον φύμα, [τοῦτο δ’ ἀν’ ἀγρῶν?]
> ῥιζοφόρων γέννημα καὶ ἀμπελοβά[μονα β̣ότρυν?·]

on the one hand among the wild species of mountain-roaming beasts, and on the other hand the twofold offspring of men, and in the case of the produce of the root-bearing fields and of the cluster of grapes mounting on the vine.

Further, in the Empedoclean opening of the poem at 1.3: 'quae mare *navigerum*, quae terras *frugiferentis*', which Sedley says is possibly a translation of a lost Empedoclean line: πόντον ναυσίπορον καὶ γαίας καρποφοροῦσας (Sedley, 1998, 24).

Here with the compounds *levisomna* and *lanigerae*, perhaps we may reasonably see a similar Empedoclean influence, and conjecture that L. is following a lost part of Empedocles' zoogony (I am grateful to David Sedley for this). Against this, Empedocles, although very fond of compounds, had no similar ones with -φορ (except διαφορ- etc.) until the discovery of the Strasbourg fragments where we do at least now find ῥιζοφόρων in the introduction to the zoogony (M&P fr. a(ii) 28). Further, the Greek equivalent for *lanigerus*, ἐριοφόρος, is not available for use in hexameters for metrical reasons, but is found in Theophr. *HP* 4.7.7 and 7.13.8 and Strabo *Geog.* 15.1.21.26 of cotton plants: 'wool-bearing trees'. The alternative, εἰροφόρος, is unattested, but εἰροπόκος, a good Homeric compound for 'sheep' (cf. *Il.* 5.137, *Od.* 9.443), is perhaps close enough.

And so *lanigerae* may well be of Ennian origin, as indeed may the whole phrase, cf. *Sat.* 66: 'propter stagna ubi lanigerum genus piscibus pascit'. It is also found in early Latin in Accius fr. 20: 'pecus lanigerum eximia pulchritudine'. But this does not preclude Empedocles being the source for both L. and Ennius, especially given Ennius' and Empedocles' links with Pythagoreanism, and the quantity of Empedoclean material to be found in Ennius. (Compare L.'s linking of the two in the Empedoclean pun on Ennius' name at 1.118–19. See Hardie 1995; Norden, 1915, 10–18; Bignone, 1929, 10–30; Skutsch, 1985, 160, 164, 260, 394–7, and 758; Harrison, 2002; Gale, 2001. See Arens, 1950 for *-fer* and *-ger* compounds generally in Latin poetry.)

L. is fond of *lanigerae pecudes* for 'sheep', cf. 6.1237 'lanigeras tamquam pecudes et bucera saecla' (also 1.887, 2.318, 2.662). Vergil uses it at *A.* 3.642 'lanigeras claudit pecudes atque ubera pressat', and is also fond of *laniger-* for sheep and goats (*G.* 3.287, *A.* 3.660, *A.* 7.93). Ovid echoes this whole line in *Met.* 6.395: 'lanigerosque greges armentaque bucera pavit', and has *lanigerae pecudes* four times (*Met.* 13.781, *Fast.* 1.384, *Fast.* 2.681, *Fast.* 4.715). Columella has it just once, *RR* 7.4.1.4: 'genus lanigerum ceteris pecudibus mollius, tum ex omnibus' (*TLL* 7.930.32 ff.).

865. genus: see on 855 above.

veterino semine partum: L. shades into teleological territory in his anti-teleological argument, cf. Cic. *ND* 2.159–60 where Balbus explains that oxen are *designed* to be draught animals. Paul.-Fest. 369 derives *veterinus* from *veho*: 'veterinam bestiam iumentum Cato appellavit a *vehendo*' (Maltby, 642). Ernout–Meillet (729) consider the proper etymology is from *vetus*, from the use of elderly animals for draught duties. At 890, L. uses this attribute to describe horses, but here we may assume that all draught animals are included since they would all give equal use, and so be preserved by the same mechanism.

semine: the Epicurean theory of embryology is pangenetic, in a similar way to Empedocles and the Hippocratics (for Empedocles, cf. Arist. *Gen. An.* 722b17–30; Aëtius 5.1.8; for the Hippocratics, Hippoc. *Nat. Puer.* 17 (vii.496.19–20)): that is that both parents contribute seed to the embryo, and the seed is drawn from all over the body (*DRN* 4.1037 with Brown ad loc.). Unlike other pangeneticists, however, the Epicurean theory is not preformationist: the seed does not contain miniature copies of individual limbs and organs, but carries an atomic pattern. This contains, in some way, an essence of each species, which ensures that species breed true and retain their ontological stability, and prevents species mutation (2.661–72, 700–29). This is clearly a genetic code theory similar to modern ideas of DNA, but with the fundamental difference that there is far less flexibility in the Epicurean genetic code than in DNA. Clearly there must be some flexibility to allow for variation and evolution within species, as we see at 1011–27 where humans evolve physiologically, but the species essence will always remain intact: no mutation can occur across the species barrier (2.661–72, cf. 923–4 below). (See Dean-Jones, 1996, 162ff.; Sorabji, 1980, 176–7; Wright, 1995, 10 and 49 ff.; Gotthelf, 1985, 215–16; and Balme on *Gen. An.* $722^{b}3$ ff. See further below on 878 ff. for problems of ontological instability associated with the atomic theory.) In this way L. can reasonably speak of a 'fixed seed' (cf. *seminibus certis* 2.708) as the essence of a species, and so also of a *veterinum semen*, although it cannot be said that the essence of a species will always produce the distinctive attributes that L. uses here to define species: an ox may evolve in such a way that it is no longer of any use as a draught animal, but still remain bovine, just as a dog may start as a wolf, and end up as a Chihuahua but still remain canine.

866. bucera saecla: L. uses similar phrases linking the *lanigerae pecudes* and *bucera saecla* at 2.661–2 'lanigerae pecudes . . . | buceriaeque greges', and 6.1237 'lanigeras tamquam pecudes et bucera saecla'. *Bucera* is from Greek βούκερως 'ox-horned', and is common in Greek, especially in medical writers, but rare in Latin, and found first here, e.g. Pliny *Nat.* 21.37.2, and 24.184.2, Servius *in G*, 3.287. Ov. *Met.* 6.395 has 'lanigerosque greges armentaque bucera'. This yoking of the *lanigerae pecudes* with the Grecism *bucera saecla* may support an Empedoclean origin for the phrase.

The Empedoclean links may be important in the context of the co-operation between animals and prehistoric humans, since Empedocles in DK31 B128 and 130 also describes harmony between animals and humans in prehistory (see Wright, 1995, ad loc., Appendix B, and below on 966 ff.).

867. Echoing 861 'commendata manent tutelae, tradita nostrae'. The language anticipates the description of the friendship pacts, and the protection of women and children by the first villagers, 1021: 'et pueros commendarunt muliebreque saeclum'. This is in line with Epicurus' (*KΔ* 32) and Hermarchus' (fr. 34 LA) discussion of prehistoric human/animal relationships within the context of the origins of justice. Further, at 1026–7 we are explicitly told that the friendship pacts were also an effective extinction avoidance strategy (see above on 860–1, and below on 1019 ff.).

Memm: Memmius, the didactic addressee of the poem, is here addressed for the first time since 5.164, and he will appear only once more in *DRN* at 1282. Given the possible Empedoclean origin of these lines (see above on 864) we may perhaps conjecture an address to Pausanias, Empedocles' addressee, at the same point in the *Physics*. It may be noteworthy that Memmius appears only in books one, two, and five, the more 'Empedoclean' and cosmological books of *DRN* (i.e. 1.26, 1.42, 1.411, 1.1052, 2.143, 2.182, 5.8, 5.93, 5.164, 5.867, and 5.1282).

tutelae tradita: along with similar phrases (*in tutelam venire* etc.), *tutelae traditus* is often used in the context of education, with the tutor *in loco parentis*, and reminds us of Memmius' dramatic role as L.'s pupil (*OLD* 1996 s.v. *tutela* 3b, e.g. Cic. *Inv.* 2.62, *De Orat.* 2.193). For the tradition of the didactic addressee, and the didactic relationship between L. and Memmius, see especially Schiesaro, Mitsis, and Strauss Clay, 1993, and also Townend, 1978; Clay, 1983; Dalzell, 1997; Toohey, 1996; Volk, 2002, 73–83; West, 1978, introduction.

3. Lines 868–870

With *pecudes* from 866, 'cupide . . . feras pacemque secuta | sunt . . . larga . . . pabula parta' remind us of the effects of Venus in 1.14–16:

> inde ferae, pecudes persultant pabula laeta
> et rapidos tranant amnis: ita capta lepore
> te sequitur cupide quo quamque inducere pergis.

Venus causes creatures to be eager for sexual reproduction, and so enables them 'cupide generatim saecla propagent' 1.20. Here their continued survival is ensured by their desire for peace and nourishment, both things associated with Venus, e.g. 1.1 *alma Venus*, and 1.30–1 'nam tu sola potes tranquilla pace iuvare |

mortalis'. Here humans have taken over some of Venus' protecting and nurturing roles to enable her creations to *propagando procudere prolem* 5.856. The 'p', 'pe', and 'pa' sounds seem to be L.'s signature for the creative force of earth/nature/Venus, as in 1.14: 'pecudes persultant pabula laeta'. The play on *pecudes*, *pacemque*, *pabula*, and *parta* here may also suggest creative etymologizing, at least of *pabula* from *parta*, emphasizing the link between birth, nourishment, and peace. Similar passages with plays on *pabula* and *pario* linking Venus, Mother Earth, and their creative and nourishing powers are found at 2.994–7 'arbustaque laeta | . . . parit . . . | pabula . . . pascunt | prolemque propagant', and 1.250–61, especially at 257 *pecudes pingui per pabula laeta*. (I am grateful to Robert Maltby for the above.) Compare Manilius' version of *DRN* 1.1 ff. in *Astron.* 3.652–7, esp. 654–5: 'tum pecudum volucrumque genus per pabula laeta | in Venerem partumque ruit . . .'.

The *praemia* are of course the fodder given to the *pecudes*, but given that one ancient etymology for *pecus* is from *pecunia* (Varro *LL* 5.95, Maltby, 459), the idea of reciprocal value is stressed: the *pecudes* receive grass as their *praemia*, the humans the *pecudes* as their *pecunia*. This fits in with the contractarian human/animal relationship given by Hermarchus (fr. 34 LA, Porph. *De Abst.* 1.10.1–1.12.7 = L&S 22N, see ibid. i. 135–6), and also prefigures the foundations of human justice in reciprocal altruism at 1011–27 (see notes there and on 860–1 above).

868–9. nam cupide fugere feras pacemque secuta | sunt: these are the behavioural characteristics that both led animals to accept domestication and enabled them to be domesticated: their eagerness to flee from predators and their desire for a peaceful existence. Sheep were easy for humans to domesticate because of their social structure (Skelton, 1993, 964) and nomadic behaviour. The shepherd establishes himself or a tethered animal as the leader of the flock and the rest follow instinctively wherever they are led. They will then flock more closely together around their leader when threatened. This behaviour enables a shepherd to control the flock by using dogs to herd them.

869. et larga suo sine pabula parta labore: there is here a hint of the Golden Age (see Appendix B s.v. 'Food: Spontaneously

Produced', and on 937 ff. below) when all crops arose spontaneously without the need for human effort, and this is underlined by the *pabula dura* (944) supplied spontaneously by the earth to humans. This Golden Age theme is also matched by that of the concord between humans and animals here (see also Appendix B s.v. 'In Harmony with Wild Animals').

On the other hand, L. understands that pastoralism involves the clearance of woodland to create pasture (5.206–9 and 1247–8). Italian farmland has been created and preserved by woodland clearance to produce pasture, or as a by-product of woodcutting for fuel, and so the concept of humans giving herbivores food is not so far from the truth. This need for humans to give animals their food to enable them to survive is directly contrary to the Stoic position whereby the fact that nature bountifully gives all animals their own proper food is an indication of Providence at work, cf. Cic. *ND* 2.121:

> *pastum* autem animantibus *large* et *copiose* natura eum qui cuique aptus erat comparavit.

Lines 871–877

Now L. sums up the section on extinctions and extinction avoidance strategies. Those species which nature granted no such abilities or which were not protected by humans were driven to extinction by predation. This summary would seem to cover both phases of extinctions: both of the unviable *portenta* (cf. 871–2 and 876) and of the viable species.

871. **at quis nil horum tribuit natura:** L. again appropriates and subverts the language of the providentialists (see on 811 above). For the Stoics, cf. Cic. *ND* 2.33:

> prima enim animadvertimus a natura sustineri ea quae gignuntur e terra, *quibus natura nihil tribuit* amplius quam ut ea alendo atque augendo tueretur.

873. **utilitatem aliquam:** the notion of usefulness is stressed again, cf. 860 and 870 and see notes ad loc. Here it is 'some sort of usefulness'. Although the attributes that make animals useful to humans are described in a limited list (watchfulness of dogs, wool-bearing of sheep, and load-pulling of horses), here L.

broadens the idea much in the way he does with the *portenta*: *cetera de genere hoc* 845 and the *saecla*: *multaque sunt* 860. The usefulness does not have to be perfect. This sort of pragmatic approach to the benefits of co-operation is typically Epicurean, as can be seen in *KΔ* 14 and 39, and *DRN* 5.1024–5, where absolute co-operation is not necessary for the benefits to be valuable (see below). Here the list could perhaps include the rearing of animals for meat, dairy animals, the keeping of cats for pest control and so on, and even the keeping of pets (see on 864).

874. Cf. 1108–10:

condere coeperunt urbis arcemque locare
praesidium reges ipsi sibi perfugiumque,
et pecus atque agros divisere atque dedere

The relationship between humans and animals is in contrast to that between the first kings and their subjects. The kings act entirely selfishly, whereas there is reciprocal advantage in the human/animal relationship here. Shepherding begins before the founding of cities, presumably in the period described at 1011–27, and as traditionally, flocks and land were held in common until the dividing of the land and the invention of property (see Appendix B).

875. praedae lucroque: the obverse of the situation in 870: outside of the protective human/animal symbiotic relationship some animals become the *praemia* of others. Compare *praedae* in 960, in the selfish competition for resources between humans.

876. fatalibus omnia vinclis: reminiscent of the creatures in 842 'vinctaque membrorum per totum corpus adhaesu', but also a more metaphorical sort of hobbling. The 'bonds of fate' are perhaps the closest L.'s language sails to the teleological wind in this whole passage (see above on 811). All such ideas are fair game for L.: not even the hateful notion of predestined doom can escape his remorseless appropriation and recontextualization (cf. *fati foedera* 2.254, *fatis avulsa voluntas* 2.25 with Fowler ad loc., and see Introduction).

877. natura redegit: see above on 811.

§4 Lines 878–924: Refutation of Compound Creatures, and the Stability of Species

Lucretius now provides the reader with a guide to the proper interpretation of the preceding passage, very much as he does in 1.44–9 after the invocation to Venus, and in 2.644–60 after the excursus on the *Magna Mater* where myth has been used to illustrate his arguments (see West, 1969, 103–14), and so this section 878–924 serves as a palinode to 772–877. Explicitly Lucretius attacks the compound creatures of myth, but he is also arguing against the compound creatures of Empedocles, because he has made such extensive use of Empedoclean ideas and language, and because their theories of adaptation by the original production of 'hopeful monsters' are fundamentally similar (see introduction to 837 ff.). The implausibility of the existence of Empedocles' ludicrous compound creatures would thus be an excellent weapon against Lucretius.

We know from Plut. *Adv. Col.* 1123 B that the Epicureans mocked Empedocles' 'ox-faced man-creatures', and Empedocles seems to have been a particular target for Epicurean polemics (Kleve, 1978, 39–71, see below on 910). As Sedley says (1998, 19): 'it can be in precisely those cases where a school is drawing upon the ideas of another that it is most at pains to minimize the resemblance'. It is perfectly possible, of course, that Lucretius follows Epicurus closely here, and that this passage reflects E.'s own criticism of the Empedoclean theory.

Another avenue for the Epicurean theory to be criticized as if it were the same as Empedocles' is provided by the lack of a clear-cut divide between humans and animals in the system (see on 805). This would almost inevitably lead to criticisms that if all creatures including humans arose by the same mechanism, by random atomic combinations, there would be no barrier to inter-species mutation, and thus that creatures compounded from humans and animals should exist. In much the same way, Darwin's ideas that humans had evolved from animals produced considerable psychological insecurity over the place of humans in nature. Philip Egerton humorously complains of such a lack of a clear human/animal divide in Darwin's theory, *Punch*, May 1861, 'Monkeyana':

> Am I satyr or Man?
> Pray tell me who I am,
> And settle my place in the scale.
> A man in ape's shape,
> An anthropoid ape,
> Or monkey deprived of his tail? . . .

Note that Egerton's first illustration of what a Darwinian creature should look like, as opposed to a fully human creature (a 'man'), is a satyr: a creature compounded of disparate human and animal parts. Ancient criticisms very probably followed the same pattern, especially since Centaurs already stood as the classic example of a crossing of the animal/human divide (see below).

Lines 878–882

878. Centauri: in 4.724 ff. in his defence of the Epicurean positivist theory of sense perception, L. accounts for images of non-existent things in two ways: either their *simulacra* assemble in the air of their own accord (as do images in the clouds at 4.129 ff.), or the *simulacra* from two or more real objects become mixed in the air and form the image, of a compound creature for example (see L&S i. 76–8; Bailey, 1947, on 4.724 ff.; and Schrijvers, 1983, 353 ff.). A link between Centaurs and Empedocles' compound creatures may be found in ancient criticisms of the Epicurean theory of sense perception. Plutarch *Adv. Col.* 1123 B (contains Empedocles DK31 B60) criticizes Colotes for mocking Empedocles' 'man-faced ox-creatures' while insisting on a positivist theory that would, in Plutarch's opinion, necessitate accepting visions of such compound creatures as real. Along similar lines, Cicero, perhaps reflecting L.'s argument here or following the anti-Epicurean tradition, has the Academic Sceptic Cotta in *ND* 1.105 argue that in Epicurean theology it does not matter whether we think of a god or of a hippocentaur, since the Epicureans prove the existence of the gods by appealing to the theory of sense perception: if we can see the gods they must be real (see Pease on *ND* 1.105, and L&S i, chs. 16–18 and 23, but note few agree with L&S that the Epicurean gods are thought constructs made up using ordinary locally produced *eidola*). Thus, Centaurs and 'man-faced ox-creatures' are interchangeable in anti-Epicurean argument, at least on sense perception, and would perhaps thus naturally be associated both in L.'s mind and those of his critics.

A further link between zoogony, compound creatures, and sense perception can be found in the first mode of Scepticism (see below on 899–900), where differences in tastes and dietary needs in creatures are explained with regard to the different modes of their birth.

Schrijvers (1983, 358 ff.) notes that many ancient thinkers, Stoics and Sceptics, have attributed the images of Centaurs 'to the combining of thoughts or images of men and horses' (Pease on Cic. *ND* 1.105), and they are often said to be seen in the clouds (Aristoph. *Nub.* 346; Cic. *Div.* 2.21.49; Diod. Sic. 3.50.4). This derivation of the images of Centaurs parallels the traditional myth of their cloud-born origins as the sons of *Nephele*, and it is either a rationalization of the myth, or perhaps the cloud-born myth arose from the idea of Centaur shapes in the clouds (see Stern on Palaiphatos *Περὶ Ἀπίστων* 1).

As Schrijvers (1983, 358 ff.) points out, the refutation of the possibility of Centaurs here follows a traditional pattern, which he considers derives from the *Περὶ Ἀπίστων* (ed. Stern, 1996) of the rational mythographer Palaiphatos (see Osmun, 1956, 134; Buffière, 1956, 228–48). Palaiphatos criticizes the possibility of Centaurs because of the incompatibility of their component parts, *Περὶ Ἀπίστων* 1:

> Horse and human natures are not compatible, nor are their foods the same: what a horse eats could not pass through the mouth and throat of a man. And if there ever was such a shape, it would also exist today. (Trans. Stern, 1996, 92)

Similar criticisms of Centaurs on the grounds of physical incompatibility are given by Theon *Progymnasmata* 95.3; Galen *De Us. Part.* 3.1; and Min. Fel. *Oct.* 20.3–4, and it would seem to be very much the standard pattern for rationalizers of myths and those, like the Christian Minucius Felix, who wished to attack ancient religion by criticizing myth. Galen gives a long refutation of Centaurs, including the problem of the nourishment of each part: would they eat grass or cooked food? It would be better if each part had a mouth. The Centaur would have two hearts. Horse legs are only good for speed; they would not be able to climb hills, ladders, or trees to collect fruit, or to climb the masts of ships. They could not sit down, or sleep in beds. The problem of Centaur nutrition is solved by C. S. Lewis in *The Silver Chair*, where Centaurs eat two breakfasts: one human, and one equine.

As usual in the zoogony, L. avoids atomic explanations, and stays within the received background tradition as much as possible, appropriating and using it for his own purposes, although Epicurean atomic arguments were available to explain species regularity, as can be seen from 2.660 ff. An atomic argument appears at 916–24 only in order to refute directly misunderstandings of Atomism itself, and can thus hardly be avoided (see below). Here the argument is firmly within the rationalist tradition, which concentrates on criticism at the macroscopic level, and so perhaps we see L. shying away from the complexity of Atomism both for better didactic impact, and because the atomic theory itself had given rise to such criticisms.

Schrijvers (1983, 364) indicates the similarities between Theon's refutation of Centaurs and the refutation by the Peripatetic Critolaus of the original spontaneous generation of humans from the earth. Theon, Palaiphatos, and Minucius Felix all use the same argument that if Centaurs ever had existed, they would still exist today. Critolaus (fr. 49 Wehrli) argues that if humans could have spontaneously generated originally, they would still do so today. This is similar to a standard criticism of Epicurean Atomism: that it is unable to account for the regularity of the universe. The order of the universe must derive from a logically prior ordering, and so must be indicative of design in the universe: the process must be the same in the present as in the beginning. As Balbus argues (*ND* 2.94): if the random collision of atoms was able to form an entire world, why does it not also create easier things today, like temples, houses, and cities? The Epicurean answer would be that, although the atomic world is chaotic at the microscopic level, limits set by the *foedera naturae* ensure its regularity at the macroscopic level. In 2.700–29 L. appropriates and inverts this sort of criticism, using compound creatures as illustrations of the consequences of having an atomic theory of matter *without* limits on atomic combinations, and at 1.146–207 he uses similar ἀδύνατα in his appropriation and inversion of the Parmenidean tenet 'nothing can come from nothing' to prove the existence of the atoms. Sir Richard Blackmore puts the argument in what, I presume, was its original form against

Epicurean Atomism, and turns L.'s own argument at 1.146–207 on its head, claiming that creation by random coalescing of atoms could not produce the order of nature, *Creation*, 1712, 3.163–9:

> If casual Concourse did the World compose,
> And Things from Hits Fortuitous arose,
> Then any Thing might come from any Thing,
> For how from Chance can constant Order spring?
> The Forest Oak might bear the blushing Rose,
> And fragrant Mirtles thrive in Russian Snows.
> The fair Pomegranate might adorn the Pine.

(for Sir Richard Blackmore and L. see Fleischmann, 1964, 228–34).

In 2.700 ff., L.'s first thought in his illustration of an irregular nature, just as is Philip Egerton's in 'Monkeyana', is of compound creatures. It may be important to note that he refers to these as *portenta* (2.701), perhaps showing that he himself unconsciously associates the two different sorts of monsters he is at pains to distinguish here: compound creatures, and the wild mutations of the type described as *portenta* in 5.837.

William Empson in his poem 'Invitation to Juno' compares Lucretius' rejection of Centaurs to Samuel Johnson's rejection of bicycle-riding. Here Darwin appears as a saviour unifying disparate parts and faculties, and restoring confidence:

> Lucretius could not credit centaurs
> Such bicycle he deemed asynchronous.
> 'Man superannuates the horse;
> Horse pulses will not gear with ours.'
>
> Johnson could see no bicycle would go;
> 'You bear yourself, and the machine as well.'
> *Gennets* for *germans* sprang not from Othello,
> And Ixion rides upon a single wheel.
>
> Courage. Weren't strips of heart culture seen
> Of late mating two periodicities?
> Did not once the adroit Darwin
> Graft annual upon perennial trees?

(I am grateful to Gillian Clark for this reference.)

A criticism strikingly similar to ancient criticisms of the atomic theory and its supposed inability to account for the ontological stability of species is found in Flann O'Brien's *The Third*

Policeman (1967, 72 ff.). In the parallel universe of the Parish, the atomic theory (otherwise 'the mollycule theory') causes a disastrous loss of human ontological integrity: due to the swapping of atoms between bicycles and their riders, people slowly turn into bicycles, and bicycles into people. The same problem occurs with horse-riding. The resulting creatures are not strictly Centaurs; they retain their outward form (their 'extraneous externalities'), but each adopts the behavioural characters of the other (see Hopper, 1995, 226–69, and Spencer, 1995):

> The Sergeant's face clouded and he spat thoughtfully three yards ahead of him on the road. 'I will tell you a secret' he said very confidentially in a low voice. 'My great-grandfather was eighty-three when he died. For a year before his death he was a horse!'
>
> 'A horse?'
>
> 'A horse in everything but extraneous externalities. He would spend the day grazing in a field or eating hay in a stall' . . .
>
> 'I suppose your great-grandfather got himself into this condition by too much horse riding?'
>
> 'That was the size of it. His old horse Dan was in the contrary way and gave so much trouble, coming into the house at night and interfering with young girls during the day and committing indictable offences, that they had to shoot him . . . but if you ask me it was my great-grandfather they shot and it is the horse that is buried up in Cloncoonla churchyard.' (O'Brien, 1967, 79)

Thomas O'Grady points out the Centaur-like qualities of O'Brien's mutating cyclists and goes on to observe ('O'Grady Says . . .', *Boston Irish Reporter*, June 1998):

> Pre-eminent Joyce scholar Hugh Kenner has even argued that the many bicycle-riding Irishmen in Samuel Beckett's novels—Molloy, Moran, Mercier and Camier, among others—are 'Cartesian Centaurs'. Observing how the Greeks 'united the noblest functions of rational and animal being, man with horse' in imagining the race of Centaurs, Kenner observes further: 'For many years, however, we have had accessible to us a nobler image of bodily perfection than the horse. The Cartesian Centaur is a man riding a bicycle, *mens sana in corpore disposito* [a sound mind in an orderly-arranged body].' (Available online at http://omega.cc.umb.edu/~irish/june1998.htm, accessed 12 April 2003)

Kenner's view would match only one type of Greek Centaur:

that of the civilized Chiron and his race. More normally, they represent a crossing of the human/animal boundary with its attendant disastrous consequences: producing a creature with the worst aspects of horse and human. Generally, Centaurs are violent, dangerous, lustful, alcoholic, anti-social creatures, just like the old horse Dan (*OCD* 308–9). In this way they also represent the consequences of the triumph of nature over culture (see especially DuBois, 1982). DuBois also makes the link between Centaurs and the compound creatures of Empedocles (ibid. 68–9), and assumes that Empedocles' system of creation by the coming together of disparate limbs could produce a successful race of Centaurs (see on 837 ff. for the contrary argument). This could be telling for possible ancient misunderstandings along the same lines: L.'s system would also be assumed to produce compound creatures.

The link between Centaurs and Empedoclean compound creatures is made explicitly by Piero di Cosimo in his Lucretian prehistory paintings, where he repopulates the prehistoric landscape with Centaurs and Satyrs. Piero in *The Forest Fire* (*c.* 1505) also adds (as an afterthought, as X-ray study of the panel shows) 'Empedoclean' 'man-faced pig-creatures' and 'man-faced deer-creatures', as an ironic undercutting of L.'s zoogony (see Whistler and Bomford, 1999; Panofsky, 1937). A similar technique is used by M. Burghers in the frontispiece to Creech's translation (5th edn., 1700), where we see a 'man-faced sheep-creature' arising from the earth at the same time as a human child, while a Unicorn stands nearby.

As A. S. Pease notes on Cic. *De Div.* 2.49, in philosophy Centaurs are frequently used as an example of a 'non-ens'. Cf. Cic. *ND* 2.5, *Tusc.* 1.90. Further such uses include: Xenophanes 1.22 (DK11b1, 22); Xen. *Cyrop.* 4.3.17; Pl. *Plt.* 303c (Pease gives an exhaustive list of references and a bibliography. See also his note to Cic. *ND* 1.105). For Centaurs, and other mythical beasts, and their use in myth and art see: Pauly 11.1, 171–8; A. H. Griffiths, in *OCD* 308–9; Kirk, 1970, 152–62; Segal, 1974, 289–300; Detienne, 1972; Schiffler, 1976; Dumézil, 1929; Borges, 1967; Evely, 1996.

878. **nec tempore in ullo:** such creatures have never been able to exist, not even momentarily as in Empedocles. L. also seeks to

clear Centaurs and other mythical creatures from the *Bildungsgut* of the prehistoric landscape (see Introduction).

879. duplici natura et corpore bino: Ov. *Met.* 12.503 describes Centaurs similarly: 'in nobis *duplex natura* animalia iunxit fortissima', and Hermaphroditus *Met.* 4.378 has a *forma duplex*. Cf. Manil. *Astron.* 1.418; Stat. *Theb.* 4.140, and 12.378. See Bömer on *Met.* 12.503 and 4.378 (*TLL* 5.1.2260.54ff.). Compare Ovid's version of Empedocles' DK31 B61 (of the Minotaur), *Tristia* 4.7.18: 'semibovemque virum semivirumque bovem', see Rusten, 1982.

880. Cassata notes (1986, 265–87) that Lachmann's punctuation, placing a comma between *compacta* and *potestas* gives a very awkward reading, separating *compacta* from *potestas* and making it neuter plural: '*creatures* put together', and making *potestas* part of the sense unit of the following line. He proposes that *compacta* agrees with *potestas*: 'their power put together', *potestas* being synonymous with *natura*, much as Greek δύναμις, comparing *DRN* 2.247, 2.277, 2.558, 5.1242, and for *compacta potestas*, 3.264 *divisa potestas* (thus also Müller ad loc., and Merrill, 1918*a*, 94–5). Chilton (1980, 378–80) notes on 853 that a sense break in the fifth foot in L. is very unusual, citing G. B. Townend (1969, 330–44. See above on 853).

881. hinc illinc par vis, ut sat par esse potissit: *hinc illinc parvis ut non sit* (*sat* Q) *pars esse potissit* OQ. The paradosis has one long syllable too many. Many different emendations have been made. Already in Lambinus' edition there were too many to list them all, but e.g.: *partis ut si par* Lachmann, *par vis ut sat par* Giussani (followed by Merrill and Costa), *partis ut sat par* Bailey, *visque ut non sat par* Munro.

Non has usually seemed the best syllable to remove (Bailey, Lachmann, Giussani, and Merrill). Giussani objected, probably correctly, to the awkwardness of *ut non*. Presumably *non* slipped in because of the distance between the negative (*nec*) in 878 that governs the whole sentence and the *ut* clause in 881, and the scribe felt another negative was necessary (Merrill, 1918*a*, 95). With *compacta* agreeing with *potestas* in 880, a new sense unit starts with *hinc* in 881, and would naturally finish after *vis*.

Therefore it seems best to accept Giussani's emendations, the nearest of all to the tradition, but with the different punctuation in 880 suggested by Cassata and Müller, which makes *hinc illinc par vis* a phrase of its own explaining and expanding 880:

> ex alienigenis membris compacta potestas,
> hinc illinc par vis, ut sat par esse potissit.

power put together from alien born limbs, *strength equal on both sides*, so that it could be equal enough.

Alternatively, if we punctuate between *par* and *vis*, then *vis* becomes part of the *ut* clause:

> ex alienigenis membris compacta potestas,
> hinc illinc par, vis ut sat par esse potissit.

power put together from alien born limbs, *equal on both sides*, so that their *strength* could be equal enough.

Taking note of Townend's assertion (1969, 330–44) that the meaning of a sentence in L. is very rarely decided by the placing of a comma, both meanings may be present. Whatever emendations we make it seems impossible to turn this into an elegant hexameter, and it may well be that the looseness of the syntax serves as syntactical onomatopoeia: an ill-made line describing ill-made creatures (cf. 839). Müller (1975, 378), after struggling with the problem, in despair finally brackets 880–1 as an interpolation and consigns the imaginary interpolator to Tartarus.

882. hinc: = 'from the following', as in 4.44, from where the line is repeated.

hebeti: *hebes* is often used in Latin philosophy and invective as a term of abuse to describe dullness of intellect (*TLL* 6.2.2581.41 ff.), or defensively in the phrase *non tam hebes, ut . . .* (*TLL* 6.2.2581.65 ff.), cf. Sen. *Nat.* 2.42.2, 7.1.1; Tac. *Ann.* 14.11; Livy 32.20.6; Cic. *Tusc.* 11.12: 'non sum ita hebes, ut istud dicam'. However, it seems often to be used against the Epicureans, perhaps by association with the pursuit of pleasure, but perhaps also because of their rejection of traditional learning, and thus their supposed ignorance and lack of erudition. Neither education, gender, nor status seems to have been a bar to membership of the Garden (Diog. Laert. 10.3, 10.5–7, 10.10), and Epicurus notoriously rejected conventional education as both unnecessary and even harmful: Epicureanism provided a better education. Cf. his advice to Pythocles to 'steer clear of every form of conventional education' (fr. 89 Arr.), and his consolation to Apelles on his lack of education: 'I count you blessed Apelles, because you have started out pure of every form of conventional education' (fr. 43 Arr.). Cf. Val. Max. *Mem.* 6.9.1.1: 'Manlius Torquatus adeo *hebetis* atque obtusi *cordis*...'; Cic. *Tusc.* 5.45.6: '*hebeti ingenio* atque nullo'; *Tusc.* 1.26: 'est enim [Epicurus] . . . non satis politus iis artibus quas qui tenent eruditi apellantur', *De Div.* 2.103: '*Epicurum* quem *hebetem* et *rudem* dicere solent Stoici . . .'; Sen. *Benef.* 7.31.3 (Epicurus fr. 364 Us., of the Epicurean gods): 'alius deos ... ignavos *hebetesque* sine luce, sine ullo opere destituit'. So L.'s use of *hebeti corde* here is part of the standard vocabulary of Latin philosophical invective, but also may be more pointed because of these frequent accusations of stupidity and coarseness levelled against the Epicureans: Doctus Lucretius turns the tables on the critics (see Asmis, 1995, 15 ff.; Obbink, 1995, 189 ff.).

Lines 883–889

Again, as in 837 ff., L. avoids Atomism and argues at the macroscopic level, as is traditional in criticisms of Centaurs, and stays within traditional arguments as much as possible (see above). There would be perfectly good atomic and embryological arguments, which may be reconstructed from 2.661 ff., against the possibility of Centaurs: the seed of each creature would each carry the wrong atomic genetic pattern, the two parts of the beast would be incompatible at the atomic level and fail to adhere etc., and indeed Aristotle *Gen. An.* 721^b7 ff. criticizes Empedoclean pangenetic embryology along similar, although of course non-atomic, lines, among other things: the seed cannot contain tiny separated limbs, they would either be complete creatures and would so be unable to join up, or if not entire creatures, would perish before they could join together and form an embryo (see Balme on *Gen. An.* 721^b7 ff., and compare L.'s parallel arguments against sentient elements at 2.907 ff., and below at 919). However, this line of argument may be too close to home for comfort here since it is used against Empedoclean embryology, which is analogous to the zoogony (see above on 837 ff.), and L. would not want to highlight the conceptual closeness of the Empedoclean and Epicurean systems, especially, in this obliquely anti-Empedoclean polemic. The argument on incompatibility of seed at 890–1 is kept brief and general.

883. **principio:** *principio* . . . *post* (886) . . . *tum demum* (888), cf. *principio* (783) . . . *exinde* (786) . . . *inde loci* (791). Here again we have the characteristic Lucretian progression, which mixes the logical and the temporal (see Fowler, 2000*d*).

883–4. **circum tribus actis impiger annis | floret equus:** *impiger* clearly goes with *floret equus*: 'the horse flourishes lively', but sandwiched between *actis* and *annis*, some of the force of *impiger* inevitably attaches to these words and produces the effect of emphasizing the swiftness of the passing of the period of the horse's immaturity. This effect is heightened by the use of *circumago* in tmesis with *tribus* . . . *annis*, which, instead of 'at *about* three years old' (as Melville and Latham translate), which we would expect with *circa* and *ago*, exhumes the dead metaphor in the phrase, giving 'when three years have come *around*' (*sic* Bailey and Munro), separating out the idea of motion contained in a phrase used to describe a static point in time.

The tmesis of *circumago* also serves to emphasize the physical separation of horse and boy, and the disjunction of the timing of their respective attainments of maturity.

As Bailey notes (1947, 123) L.'s use of tmesis falls in between Ennius' extravagance and Vergil's restraint. He often uses it for what West (1969) calls syntactical onomatopoeia: giving a graphic, or rather literal, illustration of the action of the verb, especially with verbs of separation, cutting, breaking, or coming together. The best examples of this are: 1.318, 1.452, 1.651, 2.154, 2.394, 2.1104, 3.233, 3.262, 3.343, 3.484, 3.860, 4.203, 4.247, 4.332, 4.388, 4.562, 4.887, 4.713, 4.832, 4.948, 4.1149, 4.1250, 5.287, 5.299, 5.883, 5.1268, 5.1328 (often excised), 5.1374, 6.332, 6.394, 6.456, 6.570, 6.1264.

For such illustrative uses of tmesis in L. see Sedley, 1998, 47–8; Bailey, 1947, 123; Ernout and Robin, 1925–8, introd. p. xxvii; Kenney on 3.262; Munro on 1.452; Brown on 4.1149; Godwin on 6.332; West, 1969, ch. 9; Bernard, 1960, 56 ff. and 93 ff.

impiger . . . | floret equus: cf. *equorum duellica proles* 2.662. This horse is more mettlesome than the poor drudges of 865 and

890 (*veterino semine equorum*), as is quite fitting for a horse who is (or rather is not) part of a Centaur, since they are famous for their vigour, violence, and warlike natures. *Impiger* is often used in a martial sense (*TLL* 7.1.614.52 ff.), cf. Hor. *Carm.* 4.14.22 'impiger hostium vexare turmas'; Sallust *Jug.* 7: 'Jugurtha ut erat impigro atque acri ingenio'; and often of heroes, cf. Hor. *Carm.* 4.830 (Hercules); Tibullus 2.5.39 (Aeneas); Ov. *Epist.* 3.86 (Hector); Val. Fl. 6.221 (Tages); and Tac. *Ann.* 3.48 (Quirinus).

884. puer haudquaquam: Bailey notes ad loc. that *haudquaquam* is abrupt (*TLL* 6.3.2566.58 gives this as the only example *per ellipsin*), but as with the tmesis of *circumago*, this abruptness seems very apt in describing the disjunction between horse and human, and so we have another syntactical description of the separation between the human and horse parts of the Centaur (see on 883–4, 881, and 839 above).

885. The surface argument is that the boy is still hardly more than a baby when the horse is fully mature, and so the components of the Centaur are clearly incompatible. But L.'s reference to the nourishment of the boy reminds the reader of the traditional criticism that the nourishment of each part of a Centaur would require different foods (cf. Palaiphatos *Περὶ Ἀπίστων* 1, Galen *De Us. Part.* 3.1, see above on 878). Presumably, the human part would have to eat grass to nourish the horse part, while Centaurs in myth eat raw meat. This point is also made somewhat obliquely in 899–900 (see below).

886–887. It is obvious that horses age faster than humans. However, it is interesting that while the horse part of a Centaur seems to be always represented in sculpture as youthful and in full vigour, the human part is sometimes depicted as middle-aged (see Osborne, 1994, 72–3). There may or may not be any significance in this, but it would make the contrast between the ageing rates of the constituent parts of a Centaur even sharper if the reader were aware of such representations.

886. equum validae vires: very apt for the horse part of a Centaur (or rather, here, not part of a Centaur) since Centaurs

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are particularly powerful. Further, given the ancient onomatopoeic etymological links between *vis* and *vir*, there could be a reference here to the ultra-maleness and violence of the Centaur, highlighting the imbalance of the juxtaposition of child and horse. Cf. August. *Dialect.* 6.11: 'cum dicimus vim, sonus verbi ut dictum est quasi validus congruit rei quam significat' (Maltby, 649). Lactant. *Opif.* 12.16: 'vir nuncupatus est, quod maior in eo vis est quam in femina' (Maltby, 647).

887. membraque . . . languida: as the boy enters puberty the horse's powers, perhaps sexual as well, fail; cf. Ov. *Am.* 3.7.28–9: *languent . . . | corpora* (see Adams, 1982*a*, 26, 46, and 224 for descriptions of impotence).

888–9. florente . . . | occipit: *florenta* OQ: *florente* l. 31: *florensque . . . officit* Cassata: *florere . . . occipit* Diels: *occipit* Marullus: *officit* OQ: *sufficit* Merrill.

The interpretations seem to divide between reading a contrast between the ending of the horse's vigour and the *beginning* of the boy's maturity (with Marullus' *occipit*), and the ending of the horse's vigour and the *ending* of the boy's immaturity (with OQ's *officit*). Cassata in a detailed discussion (1986, 277–8) restores *officit*, taking *puerili aevo* as dative of disadvantage, but emends *florenta iuventas* of OQ to *florensque iuventas*: 'flourishing youth puts an end to his boyish age'. This certainly has some advantage as a direct parallel to the ending of the horse's strength: 'when in old age the horse's strength *fails*, then finally the boy's childhood *ends*'. But I have accepted Marullus' *occcipit*, which allows us to keep line 888 somewhat closer to the manuscripts. For a similar line-ending compare 3.1008: *aevo florente puellas*. Cf. William Empson's 'Horse pulses will not gear with ours', above on 878.

Lines 890–898

A recapitulation of the preceding argument, and an expansion of the range of arguments against compound creatures, generalizing to cover all compound creatures with *et cetera de genere horum* 893.

890. ne forte: the basic meaning of *forte* is 'by chance', so here either 'lest *perchance* you believe' or 'lest you believe that *by* *chance* Centaurs could be put together'. *Forte* is used as 'by chance' in the sense of *casu* at 2.1059, 5.367, and 6.672 (*TLL* 6.1.1130.22 ff.), but *ne forte* elsewhere in *DRN* always seems to mean 'lest perchance', cf. 1.466, 2.718, 2.731, 4.37, 4.129, and 5.78. It seems possible that both meanings are present here, given the context. This is really the point of this whole passage on the impossibility of compound creatures: to prevent misunderstandings of this sort based on a faulty knowledge of Atomism, with the assumption that if everything was originally created by chance then anything could come into being, cf. 5.916–19 where L. implies that the misunderstanding about compound creatures arises from the knowledge that the young earth contained many seeds of things.

veterino semine equorum: see above on 865.

892–3. For a rational refutation on lines of incompatibility of parts of the Scylla cf. Palaiphatos *Περὶ Ἀπίστων* 20 (with Stern ad loc.). Cf. Verg. *Ecl.* 6.74–7, Catullus 60.1–5 (Giesecke, 2000, 38–9). See the illustration by Bauer (1703), in the Ovid Project's Ambrose Collection of illustrations, online at http://www.uvm.edu/~classics/slides/c026.jpeg, accessed 12 April 2003.

897–8. The parts of a Centaur (and of the Scylla) are incompatible both physiologically and psychologically. The incompatibility of sexual desire here is not really a fundamental objection to the existence of Centaurs or other compound creatures if they were thought to have arisen by spontaneous generation before the beginning of sexual reproduction, but would certainly prevent them breeding and so carrying on their species. The point that mutual desire between male and female of the same species is necessary for the success of a species is made by L. at 5.853–4 and 4.1197–1200, and here the impossibility of mutual desire across the species barrier is adduced to prove the impossibility of breeding success. The two parts of this argument correspond to the two main modern definitions of species:

The Biological Species Concept
'Species are groups of actually or potentially interbreeding natural populations which are *reproductively isolated from other such groups.*' (Mayr, 1970; Skelton, 1993, 372–4.)

The Recognition Species Concept
'. . . in which creatures are a part of a species which share a common fertilization system. The fertilization system *includes courtship behaviour, genital structure, and all factors that contribute to the ability to interbreed.*' (Skelton, 1993, 375, see above on 855. See also Eldredge, 1995, 106–13, 'The Eternal Species Wrangle'.)

This argument also provides an excellent criticism of the myths of Centaurs and their behaviour, since Centaurs are driven by lust to try to rape human females, and thus the argument strikes home: why should a horse be excited by a human, since the horse part usually contains the genitals of the Centaur? Just as argued by Palaiphatos *Περὶ Ἀπίστων* 2 on Pasiphae (with Stern ad loc., cf. [Apollod.] 3.1.4). But note that certain early representations show Centaurs with both horse and human male genitalia, thus avoiding the problem.

897. **nec simili Venere ardescunt:** the same mechanism of mutual desire that ensures reproductive success is adduced to prove the impossibility of inter-species breeding: the desire cannot be mutual, and so breeding success is prevented.

Cf. 4.1192 and 1197–1200:

> nec mulier semper ficto suspirat amore
> . . . .
> nec ratione alia volucres armenta feraeque
> et pecudes et equae maribus subsidere possent,
> si non, ipsa quod illarum subat *ardet* abundans
> natura et Venerem salientum laeta retractat.

Another problem that arises from this is that the mechanism for the production and gathering of seed from all over the body breaks down in a compound creature. As L. insists at 4.1040: 'ex homine humanum semen ciet una hominis vis' ('The force of a human alone rouses human seed from a human').

The *hominis vis* that rouses the seed enters through the eyes or directly into the mind while asleep, and causes the generative seed to be produced all over the body and to flow through the limbs to the genitals (4.1030–4 and 4.1052–4 with Brown ad loc. See above on 865). The images that would excite the human part of the Centaur would arouse no seed from the horse part and vice versa, and, since the horse part contains the genitals, then no seed would ever be available for breeding.

897–8. nec moribus unis | conveniunt: this would suggest the more practical difficulties of human/horse reproduction. Pasiphae of course avoided such problems by the expedient of hiding inside the model of a cow, but I shall not repeat here the fictitious slanders against Catherine the Great.

898. neque sunt eadem iucunda per artus: at first sight this may seem to go closely with the preceding argument on sexual incompatibility and to point out the problem of production of seed in a compound creature: the same things are not *sexually pleasurable* to each creature; but it becomes clear, reading on, that the lines which follow on the incompatibility of different *diets* explain this phrase: the same *foods* are not pleasant to each creature. However, L. does associate food and sex, as can be seen from 851–2:

pabula primum ut sint, genitalia deinde per artus
semina qua possint membris manare remissis

(See above on 849–54, cf. 4.1063 *pabula amoris*, 4.1091 *cibus atque umor*.) He associates diet and seed at 4.1260 ff., where diet affects the quality of seed (male and female), and food and embryology at 2.661 ff. and 2.711 ff., where the fixity of species is attributed to the great variety of atoms contained in food, so that even different species who consume the same food can absorb their proper nourishment and discard incompatible atoms. It seems likely that this association is not simply part of the poetic logic, but reflects Greek biological thinking. Aristotle considers that semen

> is (a modification of) blood. When it is 'concocted' by the superior innate heat of the male and mixed with pneuma, the semen takes on its characteristic white, foam-like appearance . . . but he also regards it, like menstrual fluid and milk in females as *surplus nourishment* (i.e. a

περίττωμα: cf. *G.A.* 725^{a}3 ff. together with 727^{a}2–4 and 739^{b}25), for the final form of nutriment in sanguineous animals is blood. (Longrigg, 1985, 280–1)

Aristotle (*Gen. An.* 724^{b} ff.) presents the haematogenous theory (the idea of semen as a concoction of the blood derived from food) as an alternative to the pangenetic theory of seed, but Longrigg traces it back in Greek thought to Empedocles, and R. Brown (1987, 184) points out the connection with pangenesis in Hippocratic writing:

> The idea is oddly incorporated with the pangenesis theory in Hipp. *Genit.* 1.2. The haematogenous theory, that semen is a transformation of the blood, may also have archaic roots but seems to stem in its philosophical form from Parmenides (DK28 B18) or Diogenes of Apollonia, who described semen as a foam of the blood arising from disturbance produced by heat (DK64 A24, B6). This notion was taken up and developed with great complexity by Aristotle, who held that *semen is a final residue left from the concoction of food into nourishing blood* (*G.A.* 725^{a}21 ff.).

L.'s linking of the two concepts of compatibility of food and compatibility of sexual desire is grounded firmly in Greek scientific thought, with the two ideas linked together by their roles in the production of seed.

iucunda: cf. 2.3, 2.19, 2.31, 2.399, 2.403, 5.1394.

6.976–7:

> at contra nobis caenum taeterrima cum sit
> spurcities, eadem subus haec *iucunda* videtur

This argument on the difference in pleasure between humans and pigs follows shortly after the argument on the difference of diet between goats and humans in 6.970 ff. (see on 899–900 below), closely linking those two examples of the diversity of pleasure for different creatures, as it links here the argument on sexual incompatibility with the argument on incompatibility of diet.

L. uses *iucundus* of both physical and mental pleasure, cf. 2.3: 'iucunda voluptas' (mental pleasure), 2.18–19: 'mente fruatur | iucundo sensu' (bodily pleasure reflected upon by the mind), 2.399: 'iucundo sensu linguae' (physical pleasure of taste), and 2.403: 'sensus iucunde tangere' (physical pleasure of taste). He does not seem to use *iucundus* in the sense of 'healthful', as Bailey translates, unless at 2.31 and 5.1394 there is something of this meaning present in the description of the Epicurean *déjeuners sur l'herbe*, and so *iucunda*, although quite clearly it is closely linked to and explained by 899–900, can retain its links with *nec simili Venere ardescunt* in 897 as expressive of the physical pleasure which arouses seed throughout the limbs.

Iucundus is also used of physical beauty and sexual attractiveness (*TLL* 7.2.1.593.41 ff., and 7.2.1.594.70 ff.), cf. Catull. 9.9, 62.26, and 62.47. In a more general sexual sense, cf. Catull. 109.1: 'iucundum, mea vita, mihi proponis amorem'. Cf. also Ov. *Am.* 2.8.3, *Ars.* 3.795, and Hor. *Epist.* 1.6.66.

Lines 899–900

The sudden appearance of goats after the discussion of horses, humans, and dogs can be explained partly by L.'s having chosen an extreme case of the necessity for different foods: the food of some creatures is actively poisonous to others, goats thrive on hemlock which kills humans, rather than stating the more obvious, but less dramatic, point that horses and humans cannot survive on one another's food, as is traditional in arguments against Centaurs (e.g. Palaiphatos *Περὶ Ἀπίστων* 1, Galen *De Us. Part.* 3.1, above on 878). Goats are also suitable for the argument following, against Chimaeras, since the middle part of that hallucinatory beast is a goat.

The form of this argument is at least as old as Heraclitus (e.g. frs. 9, 13b, and 61), and fittingly in the context of relativity, is used in various ways. Heraclitus uses various versions of it to illustrate the essential unity of opposites, DK22 B61 (Hippol. *Ref.* 9.10.5):

> *θάλασσα ὕδωρ καθαρώτατον καὶ μιαρώτατον, ἰχθύσι μὲν πότιμον καὶ σωτήριον, ἀνθρώποις δὲ ἄποτον καὶ ὀλέθριον.*
>
> The sea is the purest and the impurest water. Fish can drink it, and it is good for them; to people it is undrinkable and destructive.

(see KRS, 188–91). It is also the argument rejected in the Sophistic *Δισσοι Λογοι* ch. 1, *Περὶ ἀγαθοῦ καὶ κακοῦ* (see Robinson, 1979, ad loc.), 1.1:

> Some say that what is good and what is bad are two different things,

others that they are the same thing, and that the same thing is good for some but bad for others. (Trans. Robinson)

Goats and their unusual diet are used in two other places in *DRN*, at 4.632 ff. and 6.959 ff., both in atomic arguments, and the argument of the different effects of foods upon different animals is used without goats at 1.814–16. We should therefore expect the argument here to have an atomic basis, even though L. keeps to the macroscopic phenomenal world throughout this passage. In 6.959 ff. L. explains the atomic basis for the perceived fact that different matter (heat, water, plants, mud) has diverse effects on different creatures and different materials, in preparation for his exposition of the Epicurean theory of the workings of the magnet: the gaps between the atoms (*foramina*) are of different sizes and shapes in each kind of matter. In 4.615 ff. the same argument based on differences in atomic *foramina* is used to explain in more detail the fact that each creature has both different tastes and dietary needs. The goat's ability to thrive on hemlock (hellebore at 4.640) is explained according to the Epicurean 'lock and key' theory of sense perception (see L&S 83–6), as follows: food contains a great variety of different atoms of differing shapes in different combinations. Each creature differs in its internal atomic make-up as it does in its outward appearance: the arrangements of atoms in their bodies, and thus the spaces between them, differ. These *foramina* will have different sizes and shapes (round, square, triangular, etc.), and so will admit the molecules of different shapes (or atomic combinations) absorbed from food in different ways: hemlock, being bitter, will have sharp, rough molecules which will both taste bitter to us and cause physical damage as they enter our *foramina*, which must, therefore, be of the correct shape to admit these sharp molecules. Extrapolating from L.'s explanation that honey contains both sweet (smooth round) and bitter (sharp rough) molecules, so will hemlock. The goat, therefore, absorbs only the sweet, healthful molecules from the hemlock: it is thus both sweet and healthful to the goat. Thus, this argument again links into the Epicurean theory of sense perception: images of Centaurs are explained with respect to problems of visual perception, and here Centaurs are proved impossible with respect to the theory of taste perception. The Sceptics use a very similar argument on the different effects of the same matter on different creatures, as their first 'mode', Sextus Empiricus *Pyrrh.* 1.36: 'depending on the variation among animals', to argue against any positivist theory of sense perception: how can our senses tell us anything positive about the world if the same things produce different impressions on different creatures or different people? (See Barnes and Annas, 1985, 31 ff.) Sextus claims that hemlock fattens quails (*Pyrrh.* 1.57) as does Diogenes Laertius (9.79–80, cf. Philo *On Drunkenness* 171). Thus, we have, as with Plutarch's use of Empedoclean compound creatures to attack the Epicurean theory of sense perception and Cicero's use of Centaurs to criticize Epicurean theology (see above on 878), a further oblique link between compound creatures and attacks on the Epicurean theory of sense perception. It may also be relevant that Sextus (*Pyrrh.* 1.36 ff.) begins his explanation of mode one with reference to the different modes of birth of various creatures (spontaneous generation, oviparous, viviparous, etc.): differences of physical make-up arising *ab origine* explain differences in sense perception and dietary need. The argument here is simply the mirror of this: differences of dietary need preclude mingled births.

A further link between this argument and Scepticism and Epicureanism lies in Colotes' (Plut. *Adv. Col.* 3.1108 E9–1111 E) criticism of Democritus' assertion that all sensation is by convention (e.g. Democritus DK68 B9). Colotes claims that this removes any positive value from sense perception and makes anything οὐ μᾶλλον τοῖον ἢ τοῖον ('no more one thing than another'). Plutarch (*Adv. Col.* 1109 C ff. = L&S 16I) turns the argument against Colotes using the very 'lock and key' theory outlined above. Wine, for instance, will contain seeds of both dryness and sweetness. To one person it will taste dry, to another sweet. Neither's perception will be incorrect: each person will taste only those atoms fitted to her sense organs. Thus, each will taste only part of the wine, and neither can claim it is either absolutely dry or sweet. (For a detailed discussion see Fowler, 1984, 256 ff.; cf. Gigante, 1981, 1.5.)

Another strand of this argument may be seen with reference to 1.809 ff., where the regularity of nature is attributed to the nourishing of each creature *certis ab rebus* (1.813) which are produced by the differing arrangements of the innumerable atoms contained in all matter, as different words are formed by the rearrangement of the same letters on the page (1.823–7). The atomic argument against compound creatures, given at 2.700–17 and 2.661–6, is based on this same idea of the incompatibility of different foods for different animals. The ontological stability of species, and their ability to preserve this stability even when eating the same foods, is attributed to the limit on atomic combinations, which ensures that not all atoms may join with any other, and thus stability is ensured: each species may only absorb from the food those atomic combinations that are compatible with their own permanently fixed atomic arrangements and atomic motions.

The idea that goats can thrive on hemlock is still commonly held, and is used today as one of the arguments against vivisection for medical research: if the diets of humans and animals are so dramatically different, their reactions to drugs will be equally different, so what is the point of testing drugs on animals? However, while goats may suffer less than other animals, and may only be temporarily indisposed after eating it, poison hemlock is toxic to all grazing animals, and fatal to most, and ironically in the context of monstrous births, its consumption by goats also leads to birth defects in their kids. (Source: Indiana Toxic Plants Database, online at http://vet.purdue.edu/depts/addl/toxic/plant28.htm; accessed 12 April 2003.)

The argument on differing diets would be particularly useful against the Chimaera since this creature has the body of a goat as its central part, and so the food needed to nourish the part that gives the creature its name (*media ipsa, Chimaera* 905) would, by L.'s own example here, be poisonous to the lizard and lion parts.

899. **cicuta:** L. refers to poison hemlock (now *Conium maculatum*), which is famous as the means of Socrates' execution. The name *cicuta* was used for poison hemlock until medieval times, but was applied by Gesner in 1541 to the water hemlock (*Cicuta virosa*) which does not grow around the Mediterranean, and so Linnaeus had to revert to the Greek name *conium* for poison hemlock.

900. **barbigeras pecudes:** as with *levisomna* (see above on 864–6) this compound is found only in L., cf. 6.970: *barbigeras*

. . . *capellas*, and thus is not in the extant fragments of Ennius. Nor does the Greek equivalent *πωγωνοφόρος* (e.g. Scyl. 112; Xenocr. *ap*. *Orib*. 2.58.42; Luc. *Epigr*. 46) seem to be Empedoclean.

Lines 901–906

Cf. 2.705–6, and see Gale, 2000, 139–40. The argument against Chimaeras is different from the preceding argument against Centaurs and Scyllas where L. stresses the incompatibility of their parts (Costa ad loc.). Here, the Chimaera is rejected only because of the impossibility of its breathing fire, and except for the criticism implicit in *triplici cum corpore ut una* no attempt is made to point out that a triple-compound creature is even more unlikely than a double one because of the different ageing rates, diets, and sexual *mores* etc. of its component parts. Bailey ad loc. attributes the change in approach to L.'s thought suspension, but it seems that this change in type of argument serves as a bridge to the next section of arguments against the general physical impossibility of mythical representations of the youth of the world (5.907–15). In 2.700 ff., Chimaeras are treated together with Centaurs and Scyllas in the argument for the limit on atomic combinations. As I have said above, here Centaurs receive a different treatment, at the macroscopic level, and so it is less surprising if Chimaeras receive a different treatment again, making up three arguments in all against compound and mythical creatures: atomic impossibility (2.700 ff.), macroscopic incompatibility of parts (5.878–900), and general physical impossibility (5.901–6).

905. Long recognized as a translation of *Iliad* 6.181: *πρόσθε λέων, ὄπιθεν δὲ δράκων, μέσση δὲ χίμαιρα*, with the Chimaera presented as if with its parts out of order, just as in Homer: front, back, and then middle; serendipitously for L. illustrating the clumsiness of such a threefold beast (cf. on 839 and 881). Compare the same order in Hes. *Theog*. 319 ff., and Apollodorus 2.31, and cf. Ov. *Met*. 9.647 (with Bömer ad loc.). Cf. Phld. *Ep*. 30 Sider. For the Chimaera in general see *OCD* 322, and Pauly iii. 2279–81.

In the *Iliad* the Chimaera seems to have one head (that of a lion), but in Hes. *Theog*. 319 ff. it has three heads (snake, goat, and lion), as it does in Apollodorus 2.31, and in the Arezzo bronze (Etruscan, fifth–fourth century BCE. The snake's head of the bronze is, however, a modern restoration, Dennis, 1883, ii. 74, and 89–90). Just as Centaurs for the ancients represented something non-existent or illusory (see on 878 above), so now does the Chimaera for us. Cf. Jorge Luis Borges' description (*The Book of Imaginary Beings*, 1967, 62–3):

> As a beast it was too heterogeneous; the lion, goat, and snake (in some texts dragon) do not readily make up a single animal. With time, the Chimaera tended to become 'chimerical'; a celebrated joke of Rabelais ('Can a Chimaera, swinging in the void, swallow second intentions?') clearly marks the transition. The patchwork image disappeared but the word remained, signifying the impossible. A vain or foolish fancy is the definition of Chimaera that we now find in dictionaries.

Lines 907–915

After his refutation of compound creatures, L. singles out two seemingly Golden Age ideas for ridicule: rivers of gold and gem-bearing trees, and treats them along with another mythical idea, that of the Giants (see Appendix B). These ideas are linked in popular thought, as I note below, and may serve various functions beyond the rejection of compound creatures and ludicrous Golden Age topoi. The myths of the Giants, of course, represent a rival, ancient mythographic, view of anthropogony, and are particularly to be refuted since the Giants also are born from the earth (see Guthrie, 1957, 22, and 113 n. 13; cf. Hes. *Theog.* 185; Soph. *Tr.* 1058; Aristoph. *Ran.* 825; Diod. Sic. 1.26.7; Telecleides *Amph.* fr. 1.15 Kock).

L.'s approach here is based on an assumption that physical processes are uniform over time, and that this prevents irregularities of nature of the mythical kind ever having been possible. The rivers of gold and the gem-bearing trees are adduced as obviously impossible things, and they are used in a *reductio ad absurdum* that someone who claims compound creatures were ever possible would also go on to babble about such even more obviously ludicrous things. Thus, he is not only arguing against such Golden Age ideas, but also, as with the Centaurs, using them as topoi that are universally disbelieved. However, the argument becomes more complicated when we consider that this is very probably the same sort of argument first used against

Epicurean Atomism: that the system is only one step removed from myth, and could not account for the regularity of nature. Accordingly, we have a rhetorical rejoinder to a lost criticism, rather than a simple philosophical exposition.

It is generally agreed that this section continues the refutation of Empedocles' zoogony and prehistory (e.g. Bailey, Munro, and Ernout and Robin ad loc.). The fragments of Empedocles do not contain any of the ἀδύνατα that appear here, but there are other Golden Age topoi present in Empedocles: the original harmony between animals and humans (DK31 B130), prehistoric vegetarianism and abstention from animal sacrifice (B128), and trees bearing fruit all year round in the eternal spring of the world under the rule of Love (B77–8, against this interpretation of the fr. see Wright ad loc.), so others may also have been used. It is difficult, however, to see what purpose rivers of gold, gem-bearing trees, or giants could have in Empedocles' prehistory, any more than in L.'s, and it is reasonable to suppose along with Gale (1994, 163–4; cf. Gale, 2000, 217–18) that L. exaggerates for effect, and that the ridicule encompasses not only Empedocles but also all such ludicrous Golden Age ideas.

907. tellure nova caeloque recenti: the two polarized opposites L. himself appeals to as the creators of life, and the partners in the *hieros gamos*, cf. 'nova tellure atque aethere adulta' 800 (see above). L.'s use of such a mythologically charged image necessitates this correction.

L. uses various 'universal expressions' for 'the world as a whole', but they each give a different emphasis (Hardie, 1986, 293–335), distributed over two, three, four, five, and even six terms, e.g.: two terms: 2.1056, 5.98, 5.325, 5.344, 5.800, 6.665; three terms: 1.3–5, 1.1014, 4.203, 5.92 ff., 5.431 (=2.1063), 5.780–2, 6.678; four terms: 4.458, 5.417–18; five terms: 1.820 (=2.1015), 5.68–9; six terms: 5.432–4 (cf. Empedocles DK31 B27). Clearly the five- and six-term universal expressions itemize components of the more fundamental parts of the world (especially sun, stars, and moon as parts of *caelum*), as Hardie says (1986, 293), to 'mimic the plenitude of the universe through an enumerative exhaustiveness'. The two-, three-, and four-term expressions have more cosmological point, and present different viewpoints, and analogies. At 5.92 ff., L. makes a point of stressing the tripartite nature of the world as it appears to the earthly observer: earth, sea, and sky, in contrast with the *una dies* that will destroy the world (Hardie, 1986, 190 n. 85 sees the world as a city in these lines, and compares the destruction of Troy at Verg. *A*. 2.363). The quadripartite expressions (e.g. at 5.449 ff. in the description of the cosmogony) earth, sea, air, and *aether*, are more analytically cosmological, and separate out the world into the macroscopic elements that correspond to the microscopic elements of Empedocles, drawing an analogy between the universe as a whole and its component elements (see Castner, 1987, 40–9, and Wright, 1995, 22 ff.). This can be seen clearly in the cosmogony at 5.495 ff., where the result is:

Fiery *aether* (with stars) ☆ ⇑
Air (with sun and moon) ⇑
Sea ⇑
Earth ⇓

Empedocles' universal expressions also match his four elements, e.g. DK31 B22.2: ἠλέκτωρ τε χθών τε καὶ οὐρανὸς ἠδὲ θάλασσα (see Wright, 1995, 22–3. For a comparison of the creation of the world in L. and Empedocles see Bollack, 1965–9, i. 174–90).

The two-term expressions, as here, express an idea of polarity, and of course at the same time unity as in sexual reproduction, between the two most important generative elements of the world (see Hardie, 1986, 295, and Lloyd, 1966), and here clearly the two-term expression *tellure nova caeloque recenti* describes the interaction between the two, in analogy with human sexual reproduction, in the creation and nurturing of life, as in the traditional mythological *hieros gamos* (see on 794 ff. above).

908. **qui fingit**: the basic meaning of *fingo* is to fashion or make, especially in art, and thus to make up something and to present it as truth (*TLL* 6.1.776.50 ff.; *OLD* 702.9 d: with acc. and infin: 'to pretend, allege that'). Bailey, 1947, 479 translates: 'he who feigns that'. In the same context of argument against the possibility of compound creatures Minucius Felix seems to suggest dishonesty on the part of the myth makers with his use of *fingo*:

> maioribus enim nostris tam facilis in *mendaciis* fides fuit, ut temere crediderint etiam alia monstruosa, mira miracula: *Scyllam* multiplicem, *Chimaeram* multiformem et *Hydram* felicibus vulneribus

renascentem et Centauros equos suis hominibus inplexos, et quicquid famae licet *fingere*, illis erat libenter audire. (*Octavius* 20.3–4)

L. has a similar use of *fingo* for 'dishonestly invent', at 1.104 of the *vates*, including Ennius and Homer, who terrify with their stories of eternal punishment (cf. *ficto* . . . *amore* 4.1192). This would fit in with the historical view of mythological poetry as a carrier of religious error, and thus involved in the growth of impiety and societal discord, as given by Philodemus *De Piet.* 225–31, 265–70 Obbink. Philodemus reports that Epicurus in *Περὶ Φύσεως* 12 described an original state of true beliefs about the gods, later corrupted by false tales promulgated by prayers, sacrifices, and poetic performances. Philodemus further describes a later stage when philosophers and theologians deliberately employed such stories as instruments of social control, hence Epicurus' aversion to poetry and the traditional education based on it (Epicurus frs. 43 and 89 Arr.; Phld. *De Piet.* 1176–1217, see Obbink, 1995, 193 ff.; cf. Critias *Sisyphus TrGF* 1.43 fr. 19, with *DRN* 5.1161–1240, and see Gigante, 1957, and below on 1028 ff.). Thus all mythological poets would be criticized here, Homer especially. Empedocles is not criticized elsewhere in *DRN* for retailing false tales, not even for his theory of transmigration as Ennius is in 1.116 ff. (see Hardie, 1995, 209 ff., and Gale, 2001). Hermarchus reportedly wrote 22 books against Empedocles, in which he attacked both his prehistory and the theory of transmigration (Diog. Laert. 10.24 ff.), so we could expect L. to similarly link the topics. Empedocles could reasonably complain that the criticism here, if directed at him, is unfair since he too appropriates mythographic poetry, religious and mythological language and metaphors in order to combat false ideas about the gods. It may well be that Empedocles, because of his Centaur-like compound creatures, has become entangled in L.'s polemic against mythographic views of prehistory.

On the other hand *fingo* can have the morally neutral meaning 'to imagine' or 'to consider' (*TLL* 6.1.775.30 ff.), and this is certainly how it is used to criticize the *homoeomeria* of Anaxagoras, without any suggestion of dishonesty on Anaxagoras' part: L. simply considers Anaxagoras is wrong, 1.842: 'cetera consimili *fingit* ratione *putatque*', 1.847: 'adde quod imbecilla nimis primordia *fingit*'. (Similarly at 1.371, 1.709, 1.917, 1.1083, 2.175, 2.244, 3.90, 3.557, 3.883, 4.581, 5.713, 6.38, and 6.677.)

Fingo is equivalent to the Greek πλάσσω, which is used in very similar ways: in criticism of an opponent in philosophy, and of making up a story (e.g. Arist. *Rhet.* 1381^{b}28; Pl. *Tim.* 26e), and also of the original moulding of humans and animals, e.g. Pl. *Leg.* 746a; Hes. *Op.* 70–1; Philem. 89.1; the Septuagint Genesis 2: 7: ἔπλασεν ὁ Θεὸς τὸν ἄνθρωπον. Ovid uses *fingo* in the same way at *Met.* 1.82–3:

> quam satus Iapeto mixtam pluvialibus undis
> *finxit* in effigiem moderantum cuncta deorum

Further, at 5.3, L. uses *fingere* to describe the process of creating *De Rerum Natura* itself, and so there could well be an ironic tone to *fingo* here in the context of the creation of life, reminding the reader of the other main strand of mythical creation stories where humans are moulded by Prometheus, and of Plato's Demiurge moulding souls in *Timaeus*.

908–9. talia . . . potuisse animalia gigni | . . . nomine inani: the origin of the argument to which L. is replying: that someone (or a group of critics), has seized upon the Epicureans' (and perhaps the Presocratics') reliance on the newness of the world, and its greater vigour at that time, to allow for the spontaneous generation of large animals from the earth, and has used it to satirize the system. This is certainly close to the approach of the later critics of L. such as Sir Richard Blackmore (see introduction above), and of Critolaus (as reported by Philo *De Aet. Mund.* 55–60, see on 878 above), who, although he does not use compound creatures as a weapon, points out the inconsistency, as he sees it, of the Epicurean reliance upon uniformity of process through time while claiming a quantitative difference in process for the youth of the world.

909. novitatis nomine inani: according to Epicurus it is necessary to grasp the things subordinate to each utterance, before we are able to use it as a standard by which we may judge opinions: we must have a clear πρόληψις of the meaning of a word (its primary meaning) in order to test opinion against it, and so avoid endless explanation, or the use of words empty of meaning:

κενοὺς φθόγγους (*Ep. Hdt.* 37–8, see L&S i. 88–90, 100–1; Glidden, 1983, 186 ff., esp. 188–91; and on 1028 ff. below). Thus, it is the misapplication of *novitas* that leads to its being empty, rather than its being always an empty concept. *Novitas* would have as its primary meaning 'newness', but would also have a secondary meaning 'strangeness' as often in Ovid's *Metamorphoses* (*OLD* 1195.2.b), cf. Ov. *Met.* 8.156 (of the Minotaur): 'patebat matris adulterium monstri *novitate* biformis'. See also Ov. *Met.* 12.175 (with Bömer ad loc.). Ovid also sees the Minotaur as an Empedoclean creature, cf. his version of Empedocles DK31 B61, *Tristia* 4.7.18: 'semibovemque virum semivirumque bovem' (see Rusten, 1982).

From the Epicurean perspective, the argument does make sense. The newness of the world cannot affect the firm grounding of the *foedera naturae* in the limit on atomic combinations, and so animal species will always be distinct whether in the beginning or end of the world. While the young world is able to create larger creatures because of its greater vigour, they cannot be created by any qualitatively different process than they are today (see on 923–4 below). Therefore, the emptiness that L. complains of is the using of *novitas mundi* to claim a qualitative difference in process through time, while he claims only a quantitative difference. The point is perhaps rather tenuous, and this is what makes the Epicurean system so vulnerable to Centaurs and other ἀδύνατα. In addition, L. here argues in a highly rhetorical way: instead of carefully explaining the atomic basis of his system, when ἀδύνατα are hurled at him, he simply gives them a different spin and hurls them back.

910. effutiat: *effutiat* has a contemptuous ring to it that sits uneasily with L.'s obvious admiration of Empedocles at 1.716 ff., and especially 1.731–3 where Empedocles is described in language very nearly as flattering as Epicurus. The argument at 1.705 ff. is that the Presocratics, although their discoveries are in many ways marvellous, have, in some ways, made mistakes, and the tone of the criticism of the Presocratics is much more restrained and respectful than *effutiat* here. The word is used against the Epicureans, however, cf. Cic. *ND* 1.84 (the Academic Sceptic Cotta is speaking against the Epicurean Velleius):

> Quam bellum erat, Vellei, confiteri potius nescire quod nescires, quam ista *effutientem* nauseare atque ipsum tibi displicere.

ND 2.94 (the Stoic Balbus is attacking the Epicureans):

> Isti autem quem ad modum adseverant ex corpusculis non calore non qualitate aliqua . . . non sensu praeditis sed concurrentibus temere atque casu mundum esse perfectum . . . certe ita temere de mundo *effutiunt* ut mihi quidem nunquam hunc admirabilem caeli ornatum . . . suspexisse videantur.

Tusc. 5.8.10: 'nec haec sic agit, ut ex tempore quasi *effuttire* videatur'. *De Div.* 2.113.7: 'quorum partim ficta aperte, partim *effutita* temere'.

Effutio is a fairly rare word, but Cicero uses it four times, all in anti-Epicurean arguments (*TLL* 5.2.229.80 ff.), and so it seems possible that the word is particularly associated with charges against the Epicureans of spouting nonsense, and that L. uses it polemically in return.

Knut Kleve (1978, 39–71) analyses the philosophical polemics of the Epicureans, and finds that, among the Presocratics, Empedocles receives special attention from them (see introduction to 878 ff. above) (ibid. p. 64): Epicurus' *Περὶ Φύσεως* Book 14 (29.22–6 Arr.) Epicurus discusses Plato's use of Empedocles' four elements in *Timaeus*; *Περὶ Φύσεως Liber incertus* (36.23 Arr.) Epicurus criticizes the effluence theory of vision (probably against Empedocles); especially Hermarchus' *Ἐπιστολικά*, 22 books against Empedocles' views on prehistory, religion, and metempsychosis (Diog. Laert. 10.24 ff.); Colotes attacks Empedocles' mixture theory (Plut. *Adv. Col.* 1111 F, 1112 D, 1113 A–D) and mocks the 'man-faced ox-creatures' *Adv. Col.* 1123B; Epicurus, Metrodorus, and Hermarchus wrote against Empedocles (Cic. *ND* 1.93); Velleius criticizes Empedocles' ascription of divinity to his four elements (Cic. *ND* 1.29); Demetrius of Laconia wrote against Empedocles (de Falco, 1923, 35, 43, and 46). To this list may be added: Diogenes of Oinoanda criticizes the four-element theory of Empedocles (fr. 6 Smith, cf. *DRN* 1.716 ff.), and the transmigration theory of Pythagoras and Empedocles (frs. 41–2 Smith, cf. *DRN* 1.112 ff., 3.670 ff.). Perhaps the most curious thing about L.'s treatment of Empedocles is that he does not criticize him for the theory of metempsychosis as he does Ennius in 1.116 ff. (an Empedoclean out here that such myths are far from the truth. The standard Golden Age concept of the young earth producing wealth and nourishment unearned by humans, is clearly similar to the earth producing a juice like milk for her first offspring, as is noticed by Thomas Tenison, 1670, 132–3 (see above on 811–15), and L.'s description of the *erramento ferino* has a strongly Golden Age feel, especially in the spontaneously produced diet of the early humans at 937–8 (see below). Clearly the Epicurean system of creation relies upon the same fundamental concept as the Golden Age myths: that the earth was more generous with her bounty in her youth, and this enabled humans to survive and thrive without the need of work or technology, and so the system is an easy target on this point.

However, *aurea flumina* would inevitably remind the reader of other rivers whose gold-bearing qualities were legendary, cf. Verg. *A*. 10.142: 'Pactolusque inrigit auro'. Servius (*in V.A*. 10.142) comments: 'Pactolus et Hermus Lydiae flumina sunt, aurum sicut Tagus trahentia'. Cf. Verg. *G*. 2.136–8:

> sed neque Medorum silvae, ditissima terra,
> nec pulcher Ganges atque *auro turbidus Hermus*
> laudibus Italiae certent

L. takes real rivers (although they are already mythologized and part of the Golden Age/Golden land nexus of myth) and places them in the Golden Age proper, thus underlining the irony that gold is of no use to people in the Golden Age, since there is traditionally no need for any other wealth than the earth provides *sponte sua* (cf. 937 ff.; Ov. *Met*. 1.101 ff.; Hes. *Op*. 109 ff.; Catull. 64; Hor. *Epod*. 16. See also Sellar, 1876, 190 ff.; Taylor, 1947; Farrington, 1958). So there is an inbuilt irony in the use of 'golden' to characterize the ease and plenty of the life of early humans from the time of Hesiod (cf. *Op*. 109 *Χρύσεον γένος*). Lucian points out the irony in *Saturnian Letters* 1.20.402 f. Johnston (1980, 53) notes on Verg. *G*. 2.136 ff.:

> The superfluity of gold found in the river Hermus might be compared with the spontaneous production of luxurious items predicted for the Golden Age of the fourth *Eclogue*, and whose loss is reported in the first *Georgic* (*G*. 1.121 ff.). Instead of honey dripping from the leaves of trees or wine flowing in streams, the land has gold flowing so thickly in the streams as to make them 'muddy' with gold. The wealth is even greater

than in the Golden Age which Jupiter beneficently terminated—and correspondingly less beneficial for mankind; who cannot drink muddy water, even if the mud consists of gold.

Diogenes of Oinoanda makes a similar ethical point on the wealth of Croesus, fr. 153 II.10–12 Smith: what benefit to him were: *τοὺς π[ο]ταμοὺς αὐτῷ χρυσὸν ῥέοντας*? Schrijvers (1983, 364–5) sees a reference here in Lucretius to the myth of King Midas, who washed in the river Pactolus and so left flakes of gold in the river (Grimal, 1951, 296 s.v. Midas), and this link to Midas' story, with its ironic theme of the uselessness of gold, would fit the character of this *adunaton* neatly.

Vergil re-mythologizes the myth L. debunks here in *G.* 2.165–6, where he praises the wealth of Italy, the setting for the recurrence of the Augustan Golden Age (Johnston, 1980, 48 ff.):

haec eadem argenti rivos aerique metalla
ostendit venis atque auro plurima fluxit

Mynors (ad loc.) compares *DRN* 5.1255–7, where L. describes the discovery of metal smelting in a rational context, but with language reminiscent of the Golden Age:

manabat venis ferventibus in loca terrae
concava conveniens argenti rivus et auri
aeris item et plumbi . . .

Clearly Vergil borrows from here and 5.1255–7 (Gale, 2000, 217–18), and places the topos back in a more nearly Golden Age context. This tends to underline the link between the two Lucretian passages, and to point out L.'s use of Golden Age symbolism in 1255–7. So there is a considerable irony in L.'s debunking a myth he himself makes use of, but of course, it is his appropriation and use of such myths in the prehistory that makes such debunking all the more necessary.

912. **et gemmis florere arbusta suesse:** in much the same way as the *aurea flumina*, the gem-bearing trees would seem to be an ironic reference to Golden Age myths, since they are not present in the traditional Greek Golden Age landscape (Gale, 1994, 163–4; see Gatz, 1967, 229). Traditionally in the Golden Age the trees bear their normal fruits, but larger ones, or bear more frequently or abundantly as do L.'s arbutus trees at 940–2 (see

Appendix B s.v. 'Food'). The nearest *adunaton* would seem to be either Pindar's flowers of gold in the Islands of the Blessed (*O.* 2.72) or the golden apples of the Hesperides, cf. 5.32 'aureaque . . . fulgentia mala', and with the proximity of Atlas in 913–15, they are inevitably present here (Hom. *Od.* 1.52–4; Hes. *Theog.* 517–20; Hdt. 4.1843 and Verg. *A.* 4.246–51; see *OCD* 208. Against this interpretation see Gale, 1994, 163–4). This sort of *adunaton* is found more normally in the topography of 'blessed lands', or geographically distant 'real' lands such as India, which are often treated in a very similar way to the Golden Age, as lands of plenty where marvellous things, contrary to nature, can happen. Lucian (*Ver. Hist.* 2.17–18) satirizes such ideas, with trees of glass that bear self-filling wine glasses in his Island of the Blessed. But Lucian's satirical exaggeration of the theme is very little more extreme than can be found in some 'serious' works such as Ctesias' *Indica*, and Antonius Diogenes' *Wonders Beyond Thule* (see Morgan, 1985; Romm, 1992, 82–171). However, in Indian Vedic myths of the Tretā age, we do find trees bearing jewels and also fine cloths (cf. *Vāyu Purāna* 8.74 ff., L&B 438–9), and underlining the closeness of the Golden Age and blessed lands, along with many other traditional Golden Age topoi, the same crops are yielded by the trees of the sacred Northern Kurus (*Mahābhārata*, Bhīsmaparvan 7.2 ff.; L&B 445). Further, in the blessed Island of Śākadvīpa, the seven mountains are decked with jewels (cf. *Mahābhārata*, Bhīsmaparvan 11; L&B 445–6).

Gemmae are very often linked with gold in phrases, and seem an almost inevitable concomitant of gold (*TLL* 6.2.1754.5 ff.) as in Cic. *De Sen.* 17.59: 'Cyri ornatus Persicus multo auro multisque gemmis'. It is often used for 'plant bud' in an uncoloured way (*TLL* 6.2.1753.78 ff.), especially of vines, as in Verg. *Ecl.* 7.48: 'iam lento turgent in palmite gemmae' (cf. *G.* 2.74 and 2.335). Quintilian (*Inst.* 8.66) considers the original meaning to be 'precious stone', later transferred to vines. Ernout–Meillet (269) give the original meaning as 'bud', which is then used of jewels (thus also Cic. *Or.* 81 and *De Or.* 3.155), which would be more in line with the usual progression of metaphors from agriculture to luxury. L. plays on an agricultural wealth/luxury opposition already contained within the word, very much as in the case of the golden rivers, where there is an inbuilt irony in the use of 'gold' to characterize the wealth of the young world. Gems would also be useless to the inhabitants of the Golden Age, as they are in Sir Thomas More's *Utopia* where the children use them as marbles, and indeed the topos of the discovery of gold, and the invention of property, as the catalyst for the moral decline of the human race, that leads to the end of the blessed state of being that is the 'Golden Age', is a standard one in literature, e.g. *DRN* 5.1114 ff.; Ov. *Met.* 1.135 ff.; Pl. *Crit.* 120e ff.; Dicearchus fr. 49 Wehrli (Appendix B; Boys-Stones, 2001, 14–17). Further, the discovery of gold and other metals is often linked with the beginnings of agriculture and the dividing of the land into fields, and also with warfare, and so L.'s use of *gemmis* in this ambiguous way matches the ambiguity contained in the characterization of the 'Golden Age' by unearned agricultural wealth.

In pastoral poetry as well, trees often bear the wrong fruits, as in Verg. *Ecl.* 8.53–5. Damon has lost his love, and feels that the world is upside down: here as well the golden apples feature in a list of botanical *adunata*:

> nunc et oves ultro fugiat lupus *aurea* durae
> *mala* ferant quercus, narcisso floreat alnus,
> pinguia corticibus sudent electra myricae

The gem-flowering trees also offer us a further example of an impossible compound life form, this one compounded from vegetable and mineral. Cf. 1.159–60, 165–6:

> nam si de nilo fierent, ex omnibu' rebus
> omne genus nasci posset, nil semine egeret.
> . . . .
> nec fructus idem arboribus constare solerent,
> sed mutarentur, ferre omnes omnia possent.

Although it is clear that in 1.159–66 L. is not strictly talking about mixed trees of vegetable and mineral, the same principle holds.

Lines 913–915

In 1.199–204, L. uses the implausibility of giants as proof that nothing is created out of nothing, but everything is made up of fixed matter which determines its nature, including its *size*. It is clear in 1.201 'magnos manibus divellere montis' that the

Gigantomachy is referred to, but here in 5.913–15 the image of a man turning the sky with his hands makes it certain that Atlas is described. Schrijvers (1999, 34) insists that Atlas alone is referred to here, but the similarity to 1.199–204 would seem to make this limiting unlikely, and the reader is free to think of other giants, especially since we are not given the detail of a man turning the sky with his hands that tells us this is Atlas, until we have read the more general gigantic description of 913–14.

913. hominem tanto membrorum . . . impete natum: cf. 5.505: 'ipse suos ignis *certo* fert *impete* labens', 4.416–17:

> despectum praebet sub terras *impete tanto*
> a terris quantum caeli patet altus hiatus

As Bailey and Costa note ad loc., *impete* here, as at 4.416, is 'sweep' or 'stretch', cf. 5.200: 'caeli tegit impetus ingens' (*TLL* 7.603.55 ff.). The argument here is about size, and the impossibility of giants. L. may face greater problems with the atomic limits on possible sizes of creatures than he does with species regularity. In 1.199–204 (see above) L. argues *from* the regularity of nature to prove that there must be a fixed matter for each creature that determines its size and longevity. We may assume that critics, arguing from chaotic atomic combinations, would claim that the Epicurean theory would produce creatures of unlimited size. Critolaus (Philo *De Aet. Mund.* 59–60, fr. 13 Wehrli) criticizes ideas of the original spontaneous generation of humans on the grounds of longevity, which L. links to unlimited size in 1.199–204; and in 799–800, L. relies upon the greater vigour of the young world to allow the spontaneous generation of *larger* creatures than can be spontaneously generated today. We assume that *maiora* means 'larger *types* of animals than are produced from the earth today' in comparison to the worms and cicadas. Thus, the large animals that are now produced sexually were able to be produced from the earth. However, L. does seem to suggest in 5.941–2 that the same plants, at least, we see today were larger when the world was young: '*arbita* . . . | plurima tum tellus etiam *maiora* ferebat'. Further in 5.925–8 he does say that early humans, although not giants, were larger than people today (see on 925 ff.). Accordingly, L.'s system would seem to be vulnerable on this point of the limits of possible sizes of creatures. He gives the general theory of the growth and decay of all matter, in a sustained analogy with living things, at 2.1105 ff. where the atomic limits on size are explained. Nevertheless, it is difficult to find a clear explanation of why the young earth should have been capable of producing larger examples of present-day species, but also incapable of producing real giants.

914–15. Schrijvers (1999, 34) notes the description is of the stance of Atlas as he is portrayed in art: 'L'expression *nisus ponere* suggère ici l'image d'un Atlas gigantesque qui en franchissant les mers se met en posture sur le globe terrestre pour faire tourner le ciel.' He quotes *Enciclopedia dell'arte antica* vii. 668: 'il tipo della figura con le braccia alzate al di sopra del capo o le mani appoggiate ai fianchi; è sempre evidente in essi lo sforzo di sopportare un peso'.

Lines 916–924

L. appeals to the present-day regularity of nature to rebut the possibility that nature could have been irregular in the past. The fact that the earth was more productive and more full of generative seeds in the past could only produce quantitative, and not qualitative, differences in creatures and plants. The fact that today a law of nature prevents compound creatures ensures this. This is similar to the traditional anti-Centaur argument of Theon, Palaiphatos, and Minucius Felix who all use the same argument, that if Centaurs ever had existed they would still exist today, and to the anti-spontaneous generation argument of Critolaus (reported by Philo *De Aet. Mund.* 55 ff. (Wehrli fr. 49)) who contends that if humans were ever produced spontaneously, they would still be so today (see above on 878).

916. semina rerum: the explanation given at 2.653–4 for the earth's generative ability is her possession of many *primordia rerum*. Now L. must combat misunderstandings based on her greater past generative abilities: she could never produce compound creatures.

L. treats the generative abilities of the earth both by spontaneous generation and in the production of crops as arising from the same source: the possession of many *corpora prima* (2.594–9 and 2.652–4), and the creation of worlds and of life is presented in a similar way (5.416–31). And so the processes of the origin of life by spontaneous generation, the original creation of worlds, and the production of plant life from the earth are, from L.'s own arguments, the same, or at least they rely upon the same sufficient stock of atoms. Accordingly, it would seem that special sorts of atoms are not necessary for the original creation of life, and life will inevitably arise from the fact of the large number of different 'ordinary' atoms contained in the earth. And so the creative abilities of the earth, whether in spontaneous generation or in the production of plants from seed, have declined because of a decline in the number of all atoms in the earth rather than a decline in a number of special life-creating atoms. The greater number of *semina rerum* in the young earth is simply a greater number of the same atoms the earth contains today, and so the stability of species produced in the present day will reflect a stability of the original spontaneously generated species. The difference in present-day crops is simply quantitative: they are smaller and less fruitful because of the lack of *semina rerum*, but since the difference in the young world is only one of the quantity of available *semina rerum* rather than one of quality, the crops of the young earth will be regular and differ only in their size.

This would seem to be in accordance with the view of Epicurus, cf. *Ep. Hdt.* 74.3–6 (see Bailey, 1926, 246; Asmis, 1984, 314. Cf. Democritus DK68 A40), *Ep. Hdt.* 38.11; *Ep. Pyth.* 89.6 (see Bailey, 1926, 283–4). Epicurus seems to say that we must consider that life is present in each of the infinite number of worlds, since no one can prove that the 'right kind of seeds' σπέρματα ἐπιτήδεια (*Ep. Pyth.* 89.6) for life were or were not included in the creation of each world. Long (1977, 71–3) explains σπέρματα ἐπιτήδεια as the atoms necessary for the creation of a world, in the hypothetical sense of necessity explained by Aristotle in *Phys.* $199^{b}34$–$200^{a}15$, rather than as special sorts of life-creating atoms. In 2.1067–76, L. says that since there is plenty of matter available, if the laws of nature are the same throughout the universe then there will be other worlds and life on those worlds. No idea is given of a necessary supply of special seeds: worlds and life are formed by combinations of ordinary atoms.

917. tempore quo primum tellus animalia fudit: L. again presents the earth's first parturition as a single sudden event, and with *fudit* emphasizes the rush of animals poured out from the earth. Cf. 5.821–5 and especially 823: 'prope certo tempore fudit'.

918–22. nil tamen est signi . . . complexa creari: the language is the technical language of Hellenistic epistemology, and the argument is the second half of an argument by *οὐκ ἀντιμαρτύρησις* ('no counterwitnessing'), i.e.

> If P then Q,
> But not Q,
> Therefore not P.

If P (compound creatures in the past) then Q (compound creatures in the present). But not Q, therefore not P. (Cf. Phld. *De Signis* 11.32 ff., 34.29 ff. = L&S 18F and G; Sextus Empiricus *Adv. Math.* 211–16 = L&S 18A. See Fowler, 2002, 190–2.)

919. compactaque membra animantum: cf. *compacta potestas* 880 (see above). 'Or that the limbs of living creatures could be put together'. Not quite the same as the denial of creatures of mixed species, which could be seen as mixed at the atomic level. These have been slotted together from disparate limbs of living creatures, and are thus plainly Empedoclean creatures, which are assembled from spare parts by Love. The criticism is also that of Aristotle against Empedocles' preformationist embryology: either the limbs are themselves living creatures and so would not adhere, or if not living would perish before they made a living creature (*Gen. An.* 721^{b}7 ff., see above on 883 ff.).

921. fruges arbustaque laeta: a phrase with a Golden Age feel, used in book two in atomic arguments, often associated with the Earth-Mother and creation: on the creative power of the Earth-Mother (2.594 'tum porro nitidas fruges arbustaque laeta'), on the ability of the atoms to combine in different ways, and so to produce 'humanum genus et fruges arbustaque laeta' (2.699), in the context of the *hieros gamos* to stress the endless recycling of the atoms (2.994 'feta parit nitidas fruges arbustaque laeta'), and a similar phrase of the original fruits of the earth in the atomic explanation of the senescence of the earth (2.1157 'praeterea nitidas fruges vinetaque laeta', cf. 5.1372 on the origins of agriculture).

923–4. Cf. Verg. *G.* 2.47–72 with Gale, 2000, 208–19. For L., as for almost every other ancient scientific theorist, species are fixed (see Appendix A). The atomic laws that keep each species separate are explained in 2.661 ff. The principles that keep species distinct are the *foedera naturae* (cf. 1.586, 2.302, 5.310, and 5.924) and the, seemingly identical, *alte terminus haerens* (cf. 1.77, 1.596, 2.1087, 5.90, and 6.66). It is clear that this is a key idea for L. in both physics and ethics (see 1.77–9 where Epicurus' discovery of the *alte terminus haerens* gives him victory over *religio* and raises humans level with the heavens).

The mechanism of the *foedera naturae* was once controversial (see Long, 1977, 63–88; De Lacy, 1969, 104–13; L&S i. 56; Fowler, 2002, 377–81. Note that Long changed his mind after expressing doubts about the basis of the *foedera naturae* in Epicurean physics in his *Hellenistic Philosophy*, 1974, 41), but it can now be seen that the limits that preserve both matter and species of animals in their particular states derive from the limited number of possible atomic shapes, which cause there to be a limited variety of possible atomic combinations.

As Blundell (1986, 92–3) puts it:

> This theory of the fixity of species was seen by L. as a deduction from an atomic law of combination. Elsewhere he has argued that all compounds are made up of atoms of different classes (that is of different sizes and shapes), but that there is a limit to the combinations of classes which can be achieved: every class of atom is not capable of combining with every other class. If this were possible, you would see animals of mixed species coming into existence, but as it is, everything keeps to its own species, because every species is characterized by their distinctive atoms, which when brought together make distinctive arrangements and perform distinctive movements. In living things, these distinctive atoms are passed on from parent to child, and then they proceed to absorb compatible atoms from the nourishment that is consumed. But it is not just living things that conform to this atomic law: every atomic compound including the land, the sea, and the sky, is kept distinct by the limit on combination.

The key texts here are: *Ep. Hdt.* 42–3; *DRN* 2.478–531, 2.700–29, and 5.440–2.

For the modern theory of species stasis and punctuated equilibrium in evolution see on 855 above.

§5 Lines 925–1010: The First Stage of Human Prehistory

The other main Epicurean sources for prehistory are Epicurus *Ep. Hdt.* 75–6, *KΔ* 32, 33, 39, 40; Diogenes of Oinoanda fr. 12 Smith Hermarchus fr. 34 LA; Philodemus *De Pietate* 225–31, 265–70 Obbink.

A very considerable modern literature on this prehistory has built up over the last fifty years. In particular, I have found the following useful in compiling the commentary:

For ancient prehistories and the Golden Age generally: L&B (large collection of ancient sources, with commentary); Boas (collection of medieval sources, with commentary); Boys-Stones, 2001 (on the Stoics); Cole, 1990 (on Democritus, L., Tzetzes, and Vitruvius); Spoerri, 1959 (on Diodorus Siculus); Gatz, 1967 (detailed survey with large index of Golden Age sources); Blundell, 1986 (from the Presocratics to L.); Pelikan, 1997 (on the relationship between L., Plato's *Timaeus*, and the book of Genesis); Romm, 1992 (on ancient geography and prehistory).

Surveys of Lucretius' prehistory: Bertoli, 1980; Blickman, 1989; Boyancé, 1963, 236 ff.; Furley, 1978; Kenney, 1972; Manuwald, 1980; Perelli, 1967; Schiesaro, 1990, 91–168; Schrijvers, 1999, 1–118.

On animals and bestiality: Gale, 1991; Feeney, 1978; Saylor, 1972 and 1986; Segal, 1986; Schrijvers, 1999, 40–54.

On primitivism vs. progressivism in Lucretius: Borle, 1962; Bouquet, 1979; Fredouille, 1972; Farrington, 1953; Keller, 1951; Merlan, 1950; Robin, 1916; Ruch, 1969.

On food and dietetics: Bertelli, 1989; Segal, 1974; Mason, 1995; Levine, 1989.

On the text of Lucretius' prehistory: Cassata, 1986.

On the Golden Age and progress: Blundell, 1986, 135 ff.

On utopias: Clay and Purvis, 1999; Ferguson, 1975.

On the Golden Age and the new world: Greenblatt, 1991; Romm, 1992, 215 ff.

On myth and the Golden Age in Lucretius: Gale, 1994, 156 ff.; Schrijvers, 1983.

On Lucretius and Hesiod's Works and Days: Sihvola, 1989; Schrijvers, 1994.

On Vergil's Golden Age: Johnston, 1980.

See also: Giancotti, 1981; Lana, 1950; Nussbaum, 1994; Schiesaro, 1990; Schrijvers, 1974*b*. P. H. Schrijvers' essays on Lucretius 5.772 ff. are now conveniently collected in his *Lucrèce et les sciences de la vie*, 1999, and are well worth consulting.

L. has described the creation of the world in anti-teleological terms, and the creation of life as a similar process, governed only by chance, and limited by physical necessity. He has explained the origin of species: by competition in a survival of the fittest, or by inter-species co-operation. Now, in a natural chronological sequence, and in the traditional sequence of the Presocratics, who also link zoogony and anthropogony and the differentiation of humans from animals into a single process, he addresses the question of human development from a bestial state, and the origins of societies and civilization; a subject already richly treated in philosophy, history, and mythology before his own day (for the Presocratics on this question of human/animal differentiation, cf. Anaxagoras DK59 A102, and Archelaus DK60 A4; for the rest, see Appendix A, and Havelock, 1957, 104 ff., and 409–12).

The memes of prehistory

L. constructs his prehistory from a great range of ideas and themes available to him from poetic, dramatic, mythological, and philosophic sources as diverse as Hesiod, Homer, Democritus, Theocritus, Dicearchus, Aristophanes, the Presocratics (especially Empedocles), the Hippocratics, and Ennius. These are just some of the sources and influences that may be traced and identified, but many of the themes he uses will also be the sort of generally accepted background ideas whose origins are untraceable, and that tend to exist and evolve as if they have a life of their own independent of any writer. These Richard Dawkins dubs 'memes' (see Campbell, 2002*b*; Dawkins, 1986, ch. 5, and 1993; Dennett, 1995, 335 ff.).

Meme theory is hardly uncontroversial in biology, but it may be a very useful heuristic method to use it to view the writing of prehistory itself. By this, I mean that L., all his sources, and our own minds are conduits for ideas that have in some way an independent existence, but are expressed as texts. These are what we study, and indeed are all that we can study, the minds of their authors being unavailable to us. So, I examine two seemingly contradictory processes at work in L.: both his authorial intention, and the effects upon him of the background of received ideas on prehistory. That is: both he and his sources will be similarly infected by the memes of prehistory, and will tend to reproduce them partly in an unreflective way, and also each will identify, adopt, and use intentionally many of them, and each will give them an individual twist that will suit their own purposes. Further, our own minds are heavily infected by prehistory memes, and this fact forces us to examine our own preconceptions, as well as those of L. and his sources, before we can begin to construct a clear picture of Lucretius' prehistory. The table of themes in prehistory represents something of the common heritage of L. and his sources. Our own common heritage is sometimes very similar, and sometimes quite different.

Lucretius' skill and originality lie in his arrangement and presentation of these themes in support of his various arguments and concerns. This recognition of Lucretius' method is essentially similar to that of Schrijvers (1999, 145), who studies Lucretius' prehistory against the background of 'idées reçues', and of Spoerri (1959), who uses the term *Bildungsgut*. This has consequences for the old question, 'Is Lucretius a Primitivist, or a Progressivist?' Firstly, the question is fundamentally flawed, since these are modern anthropological terms that we retroject anachronistically on to Lucretius, and no ancient writer fits neatly into either category. Further, Lucretius' appropriation and recontextualization of themes from mythological sources to present his essentially rationalist account, brings with it a strong Golden Age flavour, since accretions of meaning will still attach to each theme from its former context. Certain themes will be so familiar and so resonant, that even Lucretius' aptitude for 'getting inside his opponents' positions and then evacuating them of their prior content to refill them with Epicurean doctrine' (Hardie, 1986, 11) will not remove all of their former associations. It is now a well-known aspect of intertextuality that recontextualization of a topos does not cleanse it of all the accretions of meaning it gained from its former context (Fowler, 2000*a*, 138–55). However, Lucretius uses this fact and allows the positive Golden Age associations of his appropriations to work for him, adding an ethical dimension to his prehistory. In this way, Lucretius will take a mythological topos and 'debunk' it, in Gale's phrase (1994, 168), replacing the former message with a rationalizing one, but leaving the appearance of the topos intact.

Thus, he presents the reader as if with a brightly coloured sugared pill, the outer coating of the myth intact and attractive, but with Epicurean medicine inside. This is perhaps a better metaphor than Lucretius' own 'honeyed cup of wormwood' (1.921–50), although in other ways his explanation of his use of myth and poetry there can hardly be bettered. Returning to the idea of memes, Dawkins (1993, 2–5) uses the analogy of computer viruses. The human mind is 'hard-wired' to absorb information, and ideas are copied, and passed on intact from one person to another unreflectively, in much the same way as a computer will copy a virus unknowingly and infect other computers. This is very useful, and is for the most part how we, especially as children, learn the large amounts of information we need in order to survive.

However, it is also problematic. Certain ideas, especially religious ones, are so attractive that they will rapidly infect entire populations. Thus, Dawkins compares religion to a particularly virulent virus. Further, unscrupulous people may actively seek to infect others, the practice especially of the religious in infecting the more receptive minds of the young, and will use an idea they know to be especially attractive as a carrier for the virus they wish to spread. This may be seen in the television evangelist's conveyance of the virus 'give me your money' by using the carrier 'blessed are the poor'.

In computing terms such viruses are known as 'Trojan horses', because they rely on their attractiveness to fool the target into accepting them. The software engineer or the doctor, faced with an infected system, a computer, or a human mind, may follow certain different paths to cleanse the system. The system may be vaccinated against the virus by taking it, hollowing it out leaving the shell intact, and filling it with new, healing information, as Hardie describes Lucretius doing. Alternatively, the virus may simply be hollowed out and left empty, as Dawkins relates he has done successfully with a computer virus: the virus is still highly infective because of its attractiveness, but it can no longer do any harm, and by its presence in the system will also prevent the system being reinfected by the 'live' form of the virus.

A third method of vaccination may be described with reference to biology. As Dawkins says, cellular machinery is extremely good at copying DNA, and seems 'eager' to copy it. Viruses or mutant genes make use of this eagerness, and disguise themselves as the DNA of their host, thus multiplying. They achieve their success by being very nearly indistinguishable from the 'real thing', only a small part of the mutant gene will have a subtly different string of DNA. In the same way, Lucretius will present topoi in very nearly their original form, but with only a slight twist. This enables the recontextualized topoi to infect the reader and to vaccinate her mind against future infection. All of these techniques are used by Lucretius in his presentation of prehistory, either separately or in combination.

Due to the ubiquity, attractiveness, and resonance of the themes that form the background to it, the topic of prehistory presents Lucretius with a peculiar problem, but also a great opportunity. To put it in terms of memes again, as our minds are infected by the Darwin meme, or rather by the pack of memes surrounding Darwinism that make up our *Bildungsgut* of prehistory, so that we will automatically tend to think in terms of hominids engaged in a violent 'struggle for life', so the minds of Lucretius' readers, and his own mind, were heavily infected by a range of memes, some of them similar to ours, and some quite different. Very roughly, two strains of *Bildungsgut* stand out: the Golden Age and associated ideas, and a rational view, in some way similar to ours, with tough, bestial, hairy, early humans fighting and struggling to survive in an unfriendly world without technology. These are certainly not mutually exclusive, and are often closely intertwined (see L&B 1–22), and may both be said to form a single block of *Bildungsgut*. Accordingly, on the one hand Lucretius has a field of prehistory laid out for him already heavily infected with mythological memes, and so he can hardly avoid discussing prehistory in traditional terms. On the other, the very large stock of traditional themes, and their attractiveness, gives him a great opportunity to practise his honeyed cup/sugared pill vaccination techniques upon prehistory, and to appropriate and debunk mythological themes, and so to vaccinate his readers against mythology, and at the same time use the power of mythology as a carrier for the virus *vera ratio*.

Ironically the honeyed cup metaphor should be particularly appropriate in the context of the Golden Age, where the landscape traditionally flows with rivers of milk and honey, or honey drips from the trees; but the motif of honey is one of the few Lucretius does not use. Honey therefore is present 'under erasure', and perhaps we may take it that the honey is represented by the Golden Age basis Lucretius gives his prehistoric landscape, aiding the reader's digestion of the harsh-seeming Epicurean message that our development of culture was not a gift of a beneficent deity, and that only we can change our lives for the better, or worse. Piero di Cosimo perhaps plays on this omission in his Lucretian prehistory painting *The Discovery of Honey*, remythologizing Lucretius' prehistoric landscape.

I therefore have a view of Lucretius' use of myth and mythographic sources quite different from that of Gale (1994, 156 ff.), who speaks of 'latent myth' in Lucretius' prehistory, explaining Lucretius' use of Golden Age themes as simultaneously a debunking or rationalizing of such myths, and a use of them as an attractive background the better to put across his message of the gradual development of culture. Both of these processes are going on, certainly, but I see the Golden Age as an integral part of Lucretius' prehistory, and the very material out of which he builds it. Certain themes are rationalized and debunked, while others are allowed to remain untouched and to do their work of vaccination simply by their recontextualization in Lucretius' account.

Lines 925–930

We view the first humans in these lines as if anatomical specimens, with this description presenting a diagram to the reader, laying their constitutions bare, even down to their bones and sinews (see on 927–8 below). We are not given a clear exterior view of them here or anywhere else in the prehistory, and their appearance is suggested only obliquely at 970 'saetigerisque pares subus silvestria membra'. We seem only to glimpse them as they wander their woodland glades, and, in strong contrast to mythological accounts, they inhabit their prehistoric landscape anonymously (see Giesecke, 2000, 57 for Vergil's technique of reversing this anonymity in the *Eclogues*).

They have now lost their state of infantile softness and dependence since we last saw them, emerging from the wombs rooted in the earth, and cradled in the soft grass of the world's youth at 807 ff. (see Nussbaum, 1994, 265), and are now adults, bigger, stronger, and tougher than we are, and more resistant to harsh climate and disease.

925. at: giants never existed, *but* the first humans were physically different, tougher, with larger bones and sinews.

genus humanum . . . illud: with *illud* L. makes a contrast between modern and early humans, although he does regard them both as *humanum*. There is clearly more implied by *illud* than simply a difference of time (Bailey, 1947, ad loc.; Costa, 1984, ad loc.), since this human race is innately different both physically and psychologically. The *genus humanum* described here is one that no longer exists, but has been supplanted by one that is softer, gentler, and more able to co-operate, or has rather been transformed by an evolutionary process from a bestial state into the modern human race by the effects of technology, environment, and socialization (see on 1014 ff.).

926. durius . . . tellus quod dura creasset: L. reminds us that the first humans were born from the earth (cf. *terrigenas* 1427, *terrigenarum* 1411) as in 795 ff. In 822–3, he implicitly derives *humanus* from *humus* (Schrijvers, 1999, 15). This is the standard ancient derivation (Maltby, 284), and the correct one (Ernout–Meillet, 297–8). Here, their toughness is attributed to their earth-origins, as it is in 1 Corinthians 15: 47–9, Genesis 2: 7 (see Pelikan, 1997, 20); and Verg. *G.* 2.340–1. In the myth of Deucalion and Pyrrha, humans are tough because of their origins from stones (the 'bones' of Mother Earth), e.g. Hes. fr. 234 M–W; Pind. *Ol.* 9.43–6; Call. *SH* 295; Verg. *G.* 1.62–3 (see Gale, 2000, 117 and 206); Ov. *Met.* 1.414–15 (with Bömer ad loc.). In other myths, tree-origin is the source of toughness (e.g. Hes. *Op.* 143 ff.; Verg. *A.* 8.315; Ap. Rhod. *Argon.* 4.1638 ff.; Stat. *Theb.* 4.279 ff.). L. continues this theme of the early humans' strength and toughness at 966–8 (cf. 1402). On the other hand, the earth is described as *mollis* at 780 in the Earth-Mother analogy. The two ideas derive from different traditions: a soft earth from the Golden Age and Earth-Mother myths, but they are linked by ancient ideas of the effects of environment upon constitution, soft environments producing soft people, and vice versa (cf. *Airs, Waters, Places* 12; Schrijvers, 1999, 84; Pöhlmann, 1879, 12 ff.).

L.'s humans have, of course, softened as they have become civilized, but the direction of softening or toughening is not simple, either in myth or in science: in the Hesiodic metallic myth (*Op.* 109 ff.), the Golden Race were softer than we are, and toughness increases in stages with the degeneration into the Silver, Bronze, and Iron races (Johnston, 1980, 10–11), cf. Hor. *Epod.* 16.64–5:

> ut inquinavit aere tempus aureum;
> aere, dehinc ferro duravit saecula.

In Verg. *A.* 8.314–18, however, hard races *precede* the Golden Age, and in *A.* 1.291, the Golden Age *softens* hard races.

The hardness of earth-born races is analogous to that of unrefined metal ore when taken from the ground (Johnston, 1980, 12). On the other hand, the successive toughening of the Hesiodic metallic races also matches the physical qualities of the metals they are defined by: gold, the most valuable, is the softest, and iron, the least valuable, the hardest (on Hesiod's metallic races see West, 1978, on *Op.* 106 ff.; Blundell, 1986, 137 ff.; Vernant, 1965, chs. 1 and 2; Toynbee, 1954, viii. 76 ff.). Progressive toughening has then a negative value in the Hesiodic myth, but a positive one in, at least, one scientific account, Hippoc. *De Vet. Med.* 3.26:

> The majority naturally perished, having too weak a constitution, while the stronger resisted longer, just as at the present time some men easily deal with strong foods, while others do so only with many and severe pains. (Trans. L&B)

This approach, granting a positive value to physical toughness and having humans becoming tougher, and thus improving, over time, is similar to that of the Cynics (see L&B 117 ff.; Gigante, 1992), who attribute toughness to early humans as a result of their acclimatization to harsh conditions of life (see Appendix B). Compare Rousseau's *2nd Discourse* pt. 1:

> Men would acquire a robust and almost unalterable constitution. The children, bringing with them into the world the excellent constitution of their parents, and fortifying it by the very exercises which first produced it, would thus acquire all the vigour of which the human frame is capable. Nature in this case treats them exactly as Sparta treated the children of her citizens: those who come well formed into the world she renders strong and robust, and all the rest she destroys.

Rousseau adds in adaptation by inheritance of acquired characteristics in the Lamarckian manner and also natural selection by the survival of the fittest.

L.'s valuation of the greater toughness of prehistoric humans is similarly complex. Firstly, this toughness has a rational basis (Blickman 1989, 162; Furley, 1978, 14–15). It can be explained as a necessary concomitant of L.'s scheme of the gradual development of technology: humans arose without technology, and so they needed to be tough to make their survival a reasonable proposition (Gale, 1994, 164–5). While we have lost a certain amount of independence and immunity to disease through becoming soft, it is this softening process that has actually made us fully human, and ironically, has enabled us to avoid extinction. As at 1011–27, 1102–4, and 1366 f., the transition from wild to tame, and from raw to cooked is presented as a softening process. Wild nature is tough, strong, and coarse, and must be softened to establish civilization (see on 1011–27 and 1102–4 below).

tellus . . . dura: the earth is now viewed in a very different way from the soft nurturing mother of 810 ff. and the 'mollia terrae | arva' of 780–1. L. now begins to stress the harshness of the lives of early people: they are hard, born from the hard earth, and their food is hard (cf. *pabula dura* 944). The earth still supplies all needs spontaneously, but her bounty is frugal and Spartan: she gives acorns and arbute berries to eat, and water to drink (see also on 939–44 and 945 ff. below). The hardness of the earth is a theme found later in Vergil's *Georgics* in a clear echo of L.'s anthropogony, where he presents a similar tension to that which we find in L. between the hard first humans born from the hard earth, and their tenderness and need for a kindlier climate in order to survive, *G.* 2.340–1:

> cum primae lucem pecudes hausere, virumque
> terrea progenies duris caput extulit arvis

927–8. L. presents here another of the themes often associated with a positive view of early humans: their greater size. This is linked closely to their greater toughness (see on 926 above), and serves a similar purpose in L.'s scheme of anthropogony: born from the earth the first humans are larger, as the fruits of the young earth are larger, due to her greater fertility.

This theme is not as common as the theme of their greater toughness, but Hesiod (*Op.* 148–9) describes his Bronze Race in terms that, although he concentrates on their great strength, suggest greater size. Pliny (*NH* 7.15) explicitly states the physical degeneration of modern people in terms of size, but Aulus Gellius is sceptical about such a decline, cf. *NA* 3.10:

> esse dicit [Varro] summum adolescenti humani corporis septem pedes. Quod esse magis verum arbritramur, quam quod Herodotus [1.68], homo fabulator, in primo historiarum inventum esse sub terra scripsit Oresti corpus cubita longitudinis habens septem, quae faciunt pedes duodecim et quadrantem, nisi sit, ut *Homerus* [e.g. *Iliad* 5.303 and 12.381–3] *opinatus est, vastiora prolixioraque fuerunt corpora hominum antiquorum et nunc quasi iam mundo senescente rerum atque hominum decrementa sunt.*

There may seem to be an irony in L.'s description of early humans as larger following the denial of the possibility of gigantism in 913–15 (cf. 1.199–204), but as so often, L.'s technique is to appropriate and rationalize the myth rather than reject it entirely: the first humans were not giants, but they were bigger than we are. Schrijvers (1999, 84ff.) suggests that L. is influenced by contemporary discoveries of fossil mammoth bones, which were mistaken for the bones of ancient heroes such as Orestes and Theseus (cf. Hdt. 1.68 on Orestes; Plut. *Thes.* 36; Paus. 1.35.7, and 8.29.1 with Frazer ad loc.; see Röscher 1.1651.62 'Gigantengebeine'; Vian, 1952, 20; Mayor, 2000). This seems possible given his concentration on bones and sinews in these lines, and his hints at an archaeological approach in

1446ff. (see Farrington, 1953), but his view would also be informed by the same background tradition that led to the false identification of the mammoth bones as those of heroes.

Perhaps the most striking feature of L.'s description of early humans for a modern reader is its similarity to reconstructions of Neanderthals. Neanderthals are thought to have been far more muscular and physically powerful than modern humans (cf. 926 *durius*), and apart from their distinctive skull shapes, their remains are most easily identified by their thicker and stronger bones (cf. 927 'maioribus et solidis magis ossibus intus'), and by the distinctive raised nodular fastening points on their bones to take the strain of their very powerful tendons (cf. 928 'validis aptum per viscera nervis') (see Stringer, 1993). Although it is uncertain whether Neanderthals were any hairier than modern humans are, they have been pictured so ever since their discovery, cf. 970 *saetigerisque pares subus*. Curiously, L. is quite correct to say that prehistoric humans were larger and more robust than we are: most modern human peoples (*Homo sapiens sapiens*) have declined considerably in both stature and robustness over the last 100,000 years, and rapidly from 10,000 to 5,000 years ago (about 7 per cent reduction in stature, 9.5 per cent in brain size: Lewin, 1998*a*, 60–1).

The greater size of the early humans also carries connotations of the 'noble savage' with it. Inhabitants of distant lands were often associated with early 'primitive' humans, and to them was attributed a simpler, more 'natural' and thus morally superior existence, very similar to that of the Golden Age. The Ethiopians, Scythians, Albanians, and Arcadians especially receive this treatment (see L&B 287 ff.), and their lives are sometimes explicitly described as 'cyclopean' (cf. Strabo *Geog.* 11.4.1.3, *Chrestomathia Straboniana* 11.21; L&B 357–8). The Ethiopians in particular are described as unusually tall and handsome: one of the signs of their superiority (cf. Scylax *Periplus* 112 (in Müller *Geog. Graec. Min.* 1.94, L&B 349); Hdt. 3.20, Pliny *NH* 6.30).

929–30. nec . . . nec . . . | nec . . . nec: compare the negatives in 818–20, 933–4, 939, 953, 958. This description by negation is a form of the priamel, and is a very common method of describing the Golden Age and the life of early humans (and other blissful places such as Elysium and the Isles of the Blest, Davies, 1987, 265 ff., see also Blundell, 1986, 135 f.). The negation implies comparison to the disadvantage of that implicitly compared: the present day (cf. Hes. *Op.* 112–15; Genesis 2: 8–3: 20; Empedocles DK31 B128; Aratus *Phaen.* 108 ff.; Verg. *A.* 8.314 ff., and *G.* 2.539 ff.; Tibull. 1.3.35 ff.; Ov. *Am.* 3.8.39 ff., and *Met.* 1.89 ff.; Sen. *Med.* 309 ff.; Stat. *Theb.* 4.278 ff.; Moschion *TrGF* 1.97 fr. 6.3 ff.; Diodorus Siculus 1.8.5; and Tacitus *Ann.* 3.26). Very many cosmogonies also employ this technique to describe the chaos before creation (Davies, 1988, 15 ff.), cf. *DRN* 5.432 ff.; Genesis 1: 1 and 2: 3; Proverbs 8.23 ff.; Psalm 90; *Rig Veda* 10.129; Ov. *Met.* 1.7 ff.; Empedocles DK31 B27, B28, and B29; Silius Italicus 11.453 ff.; many Egyptian cosmogonies (Davies, 1988, 17–18); and Icelandic cosmogonies (ibid. 20).

Compare a cosmogony of the Uitoto of Colombian Amazonia:

> In the beginning, there was nothing: no time, no space, no desert, no ocean, no eagle, no jungle, no mountain. The darkness was empty, silent, still.

On the other hand, Schrijvers (1994, 291 ff.) claims that these negatives here represent more than simply the tradition of description by negation, and that L. follows Dicearchus (fr. 49 Wehrli) in arguing polemically against a view that the first humans did suffer or die from exposure to heat or cold, from unaccustomed food, and from illness, as in the Hippocratic *De Vet. Med.* 3.26. This is possible, but the argument may be against an implied objection by the reader, or the negation may function in its normal manner, i.e. 'they did not suffer from cold or illness *as we do*', or even: 'they did not suffer from cold or illness *as we would in those conditions*'.

L. assumes that the early humans were able to withstand both heat and cold. In modern evolutionary thinking, cold-adaptation and heat-adaptation are quite different responses to environment. Peoples such as the Inuit, who live in extremes of cold, have become shorter and rounder, which aids heat conservation in the body, while peoples who live in extremes of heat have become taller and slimmer, which aids heat loss. Early-modern humans do not show any signs of cold-adaptation in their physical remains, but Neanderthals do seem to have been cold-adapted, and so again the resemblance of L.'s early humans is nearer to our ideas of Neanderthals (see Stringer, 1993, 99; Lewin, 1998*a*, 156–63).

930. nec novitate cibi nec labi corporis ulla: the first generation of infant humans was nourished by a 'juice like milk' (*sucum* . . . | *consimilem lactis* 812–13) supplied by the earth herself. They must now find their own food without guidance, either human or divine (cf. Appendix B s.v. 'Discoveries and Inventions: Granted Divinely: Agriculture/Grain'). Thus, they must experiment in choosing the foods available to them, by the process of trial and error (outlined in *Ep. Hdt.* 75–6) by which humans learned and developed all arts and technologies. Accordingly, the probability of accidental poisoning would be high (cf. 1009–10, Hippoc. *De Vet. Med.* 3.26), necessitating a greater physical resistance to unusual foods. In addition, many foods strange to the modern human diet would be tried, which could be poisonous or simply not very wholesome (cf. *pabula dura* in 944, and the acorns and arbute berries of 939–41).

The difference of the diet of the early humans from ours, and the necessity of discovering nutritious, non-poisonous foods by a process of trial and error, also serves to argue against the teleological view that each animal has been granted its own proper food by Providence (cf. Pl. *Prt.* 320d–321b; Cic. *ND* 2.121 with Pease ad loc.). An explicitly anti-teleological view of the place of humans in the world is given at 5.195–234 (cf. Origen *C. Celsum* 4.76.5–6).

The ability of the first humans to survive and thrive on their first diet is also closely allied to the development of medicine and dietetics (cf. Hippoc. *De Vet. Med.* 3.26, see on 939 below, and Cole, 1990, 51 n. 12). The theme of the lesser susceptibility to illness of the first, early, or 'primitive' humans is again a very common one in ancient prehistories and accounts of the Golden Age or blessed lands (see Appendix B, and Gatz, 1967, 229.4). It is found as early as Hesiod (*Op.* 90 ff.), runs through Antiquity, the Middle Ages, and the Renaissance up to the present day, cf. Teleclides *Amphictyons* (in Ath. *Deipnos.* 6.268; L&B 40). For the Cynics cf. Diog. Laert. 2.24–8; Epictetus *Disc.* 3.24.67 f.; Xen. *Symp.* 4.34–44; Stobaeus *Florileg.* 9.49; Diog. Laert. 6.104; Julian *Orat.* 6.191–3; L.&B 117 ff. It is another of the defining themes of both the Golden Age and Noble Savagery (Montaigne *Essay on the Cannibals* and De Léry *Histoire* ch. 8 use it of the Tupinamba of Brazil), see L&B 287 ff.; Boas, 129 ff.; Greenblatt, 1991.

Perelli (1967, 158) compares Dicearchus fr. 49 Wehrli (see Boys-Stones, 2001, 14–17), which describes ancient people living without illnesses, and contrasts the Hippocratic *De Vet. Med.* 3.26, which claims that it is a mistake to think that early humans could have been healthy on their diet of spontaneously produced food, eating like animals, and that they developed resistance and toughness in time, with the extinction of the weaker. It is clear that L. follows a tradition nearer to that of Dicearchus than to *De Vet. Med.* 3 (Schrijvers, 1994, 291 ff.). L.'s first humans are, physically, more than capable of surviving; it is their psychological limitations that would have led to their extinction had they not evolved (see on 1011–27). However, part of the programme found in *De Vet. Med.* 3 is also present in the description of the sufferings of the first humans from lack of medicine, their painful deaths from untreated wounds in 994–8, and in the accidental poisonings of 1009–10.

Lines 931–932

Compare Ovid's condensed version, *Ars. Am.* 2.474: 'tum genus humanum solis errabat in agris'. The *volventia lustra* of the sun mirror the wanderings of the first humans, and this gives the feel of a cyclical process, underlining the length of time covered by this lifestyle, cf. Manilius 1.79: '*longa dies* acuit mortalia corda', Ov. *Ars Am.* 2.476: '*diu* nulli cognitus alter erat', and Pl. *Leg.* 3.677d ff. (see above on 826 ff.). There is often a sense of timelessness about the first age of humanity, here emphasized by the spondees and 'u' and 'v' sounds. Life speeds up as technology progresses, just as the seasons, once static in the eternal spring, increase their pace and force; and so we yearn for the leisurely days of the past (cf. Ov. *Met.* 1.116–19). Hesiod's five ages move from the static leisure of the Golden Race to the frenetic energy of the Iron Race, and there seems to be a concomitant shortening of lifespan (*Op.* 109 ff.). Similarly, the Indian *Yugas* decline in length from 4,800 divine years for the *Krta Yuga* to 1,200 for the *Kali Yuga* (P.-E. Dumont in L&B 433). Perhaps we glimpse the point of view of the first humans: their days, and their lives, seem long and empty, unmarked by the present-day changes in seasons, or by the mundane divisions of time into hours of work and rest.

This theme of the first humans living like wild animals, a θηριώδης βίος, is very common indeed, and is found in many different contexts (see Appendix B under θηριώδης βίος, and Gatz, 1967, 231.6d). It is especially one of the classic topoi of rationalist prehistories, with the miserable, brutish, beast-like existence of humans gradually improved by the discovery of arts and technologies (cf. Diod. Sic. 1.8.1; Hippoc. *De Vet. Med.* 3.26; Archelaus DK60 A4; Pl. *Crit.* (DK88 B25); Moschion *TrGF* 1.97 fr. 6; Polyb. *Hist.* 6.4–6; Eur. *Suppl.* 201–2). The θηριώδης βίος can serve to point out that the early humans were not divinely gifted with technology, and so had to acquire it themselves gradually, as here in L.; or it can point out the reason for the gods' gifts of technology to humans. Some accounts explain the lack of technology in the θηριώδης βίος as either deriving from the spite of the gods against humans (cf. Hes. *Op.* 42 ff.; Aesch. *Prom.* 447 ff.), or as a deliberate spur to human ingenuity (cf. Vergil *G.* 1.121 ff.). Traditionally, early humans may be beast-like behaviourally, physically, or both, and their wandering homeless life defines their primitiveness. This life may be either one of freedom and simplicity, or one of hardship and misery. Here *more ferarum* underlines their bestiality, but the attractive pastoral description of this wandering life that follows removes much of the traditional pejorative force of the θηριώδης βίος (Blickman, 1989, 163: 'masterstrokes of primitivist colouring', and Gillis, 1967, 357: 'a superb pastoral poem'), making the account much more positive.

Vulgivagus is another compound found only in L.: here and at 4.1071, but compare the similar πολυπλαγκτός (e.g. Hom. *Od.* 17.425; Eur. *HF* 1197). For another compound with *vagus*, in a similar bestial context, compare *montivagus* 2.597 and 1081, and L.'s probable source for this, Empedocles fr. a(ii) 26 M&P: θηρῶν ὀριπλάγκτων (but compare Aristoph. *Thesm.* 326, see above on 864–6). At 4.1071, the context is of sexual promiscuity as a cure for love (*vulgivaga . . . Venere*), and thus *vulgivagus* is apt here since the first humans are also sexually promiscuous (cf. 962–5. We need not, however, agree with Beye (1963, 166) in seeing here an Epicurean ideal of natural sexuality. See below on 962–5).

This use of the pastoral genre is perhaps less indicative of L.'s philosophical view of prehistory than it may seem, however, since pastoral is the 'natural' genre for describing 'primitive' peoples and its own roots lie deep in cultural primitivism, and, in its idealization of the simple life of pre-civilized or marginal peoples, assumes a positive view (see Gale, 1994, 170–1; Coleman, 1977, 6 ff.). The theme of the wandering life has a particular resonance in pastoral poetry, especially in the tension between the simpler wandering life of shepherds and the settled life of farmers (see Johnston, 1980, 106–24). This cultural primitivism inherent in pastoral poetry is closely connected to the dominant ancient view of pastoralism as chronologically prior to agriculture (cf. Pl. *Leg.* 3.676 ff.; Varro *RR* 1.2.16 and 2.1.3 ff.; Dicearchus fr. 49 Wehrli (see Boys-Stones, 2001, 14–17)). This has long been known to be false. Sauer (1952, 84) shows that pastoralism arises alongside agriculture in the archaeological record in the Middle East, and that the two economies are closely interconnected (see also Childe, 1936, 66 ff.).

Lines 933–944

The technique of description by negation continues, and we are told there was no agriculture, and no knowledge of ploughing, arboriculture, or planting: the earth gave up her bounty spontaneously. In myth, this is the classic defining quality of the metallic Golden Age: agriculture was not necessary because the earth yielded up her bounty of her own free will (see Appendix B, and Gatz, 1967, 229.I.1 & 1a). The life of the first humans was one of ease and plenty, and this was matched by (or due to) their moral excellence (cf. Hes. *Op.* 109 ff. with West ad loc., Aratus *Phaen.* 96 ff., and L.'s argument against this idea 2.1164 ff.). Agriculture, and work, becomes necessary when the earth ceases her bounty, and thus the new art may be a precious gift of the gods, but usually one of secondary value to the previous state of leisure (see Johnston, 1980).

Here we have an appropriation and rationalization of such bounty, perhaps borrowing from Hes. *Op.* 116–19, or simply following the traditional pattern: the earth was more bountiful then, but her bounty was of plentiful 'tough fodder' rather than milk and honey. It is also rationalized by Dicearchus (fr. 49 Wehrli), as inevitable because of the lack of farming technology, and later by Varro *RR* 2.1.3, and Diod. Sic. 1.8.1–2: instead of rejecting the idea completely, it is modified, and the earth's bounty is made more moderate in quantity, and more natural in kind. Dicearchus quotes Hes. *Op.* 116–19 at the start of his discussion of the state of the first humans. Schrijvers (1999, 87–9) considers that L.'s use of the theme of the spontaneous bounty of the earth forms part of a running dialogue between him and Dicearchus, both using Hesiod as authority. However, the theme of the earth's spontaneous bounty is so ubiquitous that, while L. may well borrow from Hesiod, it need not be assumed that this shows a direct connection with Dicearchus, since Hes. *Op.* 116 ff. is so well known that it serves simply as a useful shorthand for the introduction of the theme of the earth's spontaneous bounty (see also Blickman, 1989, 163; Gillis, 1967, 357).

Despite the recontextualization into a rational prehistoric setting, a good deal of the former positive Golden Age feel still adheres to it; a fact that L. exploits to encourage the reader to swallow the bitter pill of his gradualist view of prehistory: the former divine beneficence that made the arts of agriculture unnecessary is now the carrier of an inoculation against the notion of divine beneficence. The very large number of appearances of this theme in ancient, medieval, and modern literature attests its enduring popularity, especially as part of a positive view of the life of early humans, or the lives of 'simpler' or 'primitive' peoples living at the margins of the known world, and if anything in L.'s prehistory may be identified as a meme, it is this (see Appendix B, and compare Montaigne's use of it of the Tupinamba of Brazil (*Cannibals* 1.31)). The theme is found in similar language in *Odyssey* 9.106 ff. of the island of the Cyclopes, and as I have noted on 925 ff., L.'s first humans bear more than a passing resemblance to the Cyclopes in their greater strength, lawlessness, and wildness, and certainly a greater resemblance than to Hesiod's Golden Race. Finding the topos of the spontaneous production of food by the earth used in such different contexts in Homer and Hesiod indicates that it was common currency by at least Hesiod's time, and that its origins may be so ancient as to be untraceable to any one writer, genre, or even country.

Agriculture is present in prehistory in another tradition: the agricultural Golden Age of Latium under Saturnus (cf. Verg. *G.*

2.538, see Johnston, 1980, 62 ff.), and, more generally, an agricultural Golden Age may be placed either in the future, as in Diogenes of Oinoanda fr. 56 Smith, or in a past Golden Age, as in Aratus *Phaen.* 96 ff., where Dike ploughs for humanity, but humans are free of agricultural toil. Vergil's presentation of the future Golden Age in *Eclogue* 4 follows the agriculture-free pattern of the metallic myth, but the *Georgics*' agricultural theme moves between the past and future, and from *labor* . . . | *improbus* in 1.145–6 at the end of the metallic Golden Age, to the entirely positive view of work in *Georgics* 4 (see Johnston, 1980).

Often the state of freedom from agriculture is placed in a setting of pastoralism, as in *Odyssey* 9.106 ff., where the Cyclopes live in a land that produces crops spontaneously but they subsist by herding (see Mondi, 1983, and Kirk, 1962, 263 ff.). This approach appears also in Hes. *Op.* 109 ff. where the Golden Race are fed spontaneously by the fruitful earth, but their rich flocks are presented as one of the bounties they are granted. There is in these stories a shading into an 'Arcadian' pastoral ideal life, situated in geographically distant or in mountainous regions, that overlaps often with a chronologically distant Golden Age (note, however, that the idealizing of Arcadia itself as a pastoral paradise begins after L. with Vergil, or is perhaps even a Renaissance invention. See Jenkyns, 1989, 26 ff.; Kennedy, 1987, 47 ff.). This theme of a pastoral Golden Age is popular from Homer to the Renaissance and beyond (see L&B 287 ff. and Boas, 129 ff. on 'The Noble Savage'). The lack of agriculture, combined with the pastoral life, is eulogized in many semi-mythical peoples including the Germans (Caes. *B. Gall.* 6.22), the Scythians (Hdt. 4.19.46–7), and the Hebrideans (Solinus *Collectanea App.* 22.12–15).

933–4. nec robustus . . . aratri | quisquam: for the idea in another tradition cf. Genesis 2: 5: 'et homo non erat qui operaretur terram'. The theme of the toughness of the ploughman is repeated at 6.1253. Vergil is fond of the idea, cf. *Ecl.* 4. 41 (Giesecke, 2000, 54–5), *G.* 2.264, and 4.512 (cf. *G.* 1.19 with Gale, 2000, 30 and Mynors ad loc.). L.'s first humans derive their toughness directly from the earth. The ploughman derives his indirectly from the same source (cf. 5.1357–60). The description of the ploughman as *robustus* links him with the tough earth-born race, while highlighting the opposition between them that L. draws.

933–6. curvi . . . aratri | . . . falcibu' ramos: the *aratrum* and the *falx* are the traditional symbols of agriculture, just as the hammer and the sickle in the Soviet Union represented industry and agriculture (see Mynors on Verg. *G.* 1.157), cf. Varro *RR* 2 *praef.* 3: *relictis falce et aratro* (*TLL* 6.1.203.45 ff.); Moschion *TrGF* 1.97 fr. 6.46 ff.: οὐ μὴν ἀρότροις ἀγκύλοις | . . . οὐδ ἐργάτης σίδηρος.

Ploughs are very often curved (cf. 1.313–14, 6.1253; Verg. *G.* 1.19, 1.494, 2.513; Ov. *Her.* 1.55, 17.139, *Met.* 3.11, 15.123, *Fast.* 2.51, 3.781, *Am.* 3.8.38 f.; Manilius *Astron.* 4.556). Vergil explains their construction in *G.* 1.169 ff., where he describes the bending of a growing elm tree into the shape of the ***burim*** (the plough-stock). See Mynors, and Servius ad loc.

Falx is a general name for many types of curved cutting implements (see Mynors on Verg. *G.* 1.157; White, 1975, 71–103, 205–11), but here it is a pruning hook, and, in the context, probably for pruning the elms on which vines are grown (or rather not pruning them), or the vines themselves (cf. the links between pruning, vines, and the lack of agriculture in Moschion *TrGF* 1.97 fr. 6.46 ff., and Verg. *Ecl.* 4. 40: 'non rastros patietur humus, non vinea falcem'). The *falx* is the emblem of Saturnus, who is depicted carrying one in his role as a god of agriculture or king of ancient Latium in the Saturnian agricultural Golden Age, cf. Verg. *G.* 2.406: *curvo Saturni dente* (see Johnston, 1980, 62 ff.; Mayor on Juv. 13.39; Grimal, 412; *TLL* 6.1.205.73 ff.). Here the lack of the use of the *falx* for pruning in prehistory inevitably recalls the Saturnian myth, and argues against it obliquely.

934. nec scibat ferro molirier arva: cf. 1286 ff. on the discovery of the use of metals, 1289: 'aere solum terrae tractabant'; 1295: 'ferro coepere solum proscindere terrae'. The comparison here is with the present day; hence, the iron plough. Cf. Moschion *TrGF* 1.97 fr. 6.46: σίδηρος. Cf. Vergil's remythologizing of the topos in *G.* 1.147 (Gale, 2000, 66 n. 29).

Although agriculture was not strictly necessary because of the earth's greater largesse, it was ignorance of technology that prevented farming: a rationalizing perspective, just as in Dicearchus fr. 49 Wehrli; Diod. Sic. 1.8; Varro *RR* 2.1. Compare Plato's subversion of the idea for the teleological view in *Plt.* 274c–d.

935–6. Cf. the near-repetition of 935 in the passage on the discovery of agriculture at 1366.

937–8. quod sol atque imbres dederant, quod terra crearat | sponte sua: see above, introd. to 933–44. Cf. Hes. *Op.* 117–18:

καρπὸν δ' ἔφερε ζείδωρος ἄρουρα
αὐτομάτη πολλόν τε καὶ ἄφθονον·

And the grain-giving soil bore its fruit of its own accord in unstinting plenty.

Hom. *Od.* 9.106–11:

Κυκλώπων δ' ἐς γαῖαν ὑπερφιάλων ἀθεμίστων
ἱκόμεθ', οἵ ῥα θεοῖσι πεποιθότες ἀθανάτοισιν
οὔτε φυτεύουσιν χερσὶν φυτὸν οὔτ' ἀρόωσιν,
ἀλλὰ τά γ' ἄσπαρτα καὶ ἀνήροτα πάντα φύονται,
πυροὶ καὶ κριθαὶ ἠδ' ἄμπελοι, αἵ τε φέρουσιν
οἶνον ἐριστάφυλον, καί σφιν Διὸς ὄμβρος ἀέξει.

And we came to the land of the Cyclopes, a fierce lawless people who never lift a hand to plant or plough but just leave everything to the immortal gods. All the crops they require spring up unsown and untilled, wheat and barley and vines with generous clusters that swell with the rain from heaven to yield wine. (Trans. E. V. Rieu)

Ov. *Met.* 1.109–10:

mox etiam fruges tellus inarata ferebat
nec renovatus ager gravidis canebat aristis

938. satis id placabat pectora donum: the first humans had only moderate desires, and these were easily satisfied by acorns, arbute berries, and the like. This chimes in with both the common Golden Age topos of the greater moral excellence of earlier people, and the greater simplicity of their diet (see Appendix B), and also with the cultural primitivism of Epicurean ethics. L. can accept that the traditional view has some justification, thus aiding the acceptance of his message. He also uses it to contrast and criticize modern *mores* (cf. 1007–8), to illustrate Epicurean ethics in a natural setting, and to privilege Epicurean ethics as chronologically, and thus logically, prior to any other system: ethics of a rudimentary Epicurean kind arose naturally. Compare the Epicurean *déjeuners sur l'herbe* of 2.29 ff. (present day) and 5.1390 ff. (prehistoric), where the repetition of the lines signals the diachronic analogy between present-day Epicurean ethics and prehistoric simplicity (see below on 939; Gale, 1994, 147 ff.; and Farrington, 1953, 59–62).

In Epicureanism, achieving happiness by reducing wants and desires to a minimum lies at the heart of the ethics (cf. *Ep. Men.* 127–32, *KΔ* 3, 4, 8, 9, 10, 18, 25, 30; *Vatican Sayings* 17, 21, 25, 33, 42, 51, 59, 63, 71, 73, 81; *DRN* 2.1–61, 5.1117 ff.; and the other sources in L&S 21A–C. See also L&B 152–4). Here L. draws close to the more radically ascetic ethical doctrines of the Stoics and Cynics (Perelli, 1967, 159–60); for Cynic cultural primitivism see L&B 117–52, e.g. Diog. Laert. 6.1–19 (on Antisthenes), 6.20–81 (on Diogenes); Dio Chrys. *Or.* 4, 6, 8, 9, and 10; Julian *Or.* 6 and 7; Stob. *Florileg.* (Mullach *Frag. Philos. Graec.* 2, 261–395); and for the Stoics see L&B 260–86, e.g. Sen. *Ep.* 90 (reporting the views of Posidonius fr. 284 E–K), *Ep.* 88, *Med.* 301 ff., *Phaedra* 446 ff.; and Diog. Laert. 7 (on Zeno). In Seneca's *Ep.* 90 (Posidonius fr. 284 E–K), there seems to be an argument going on between the Stoics and Epicureans over who may justifiably claim prehistoric humans as ethical exemplars. Seneca rejects an unattributed claim (Epicurus' own, L.'s, or a popular view?) that early people were natural Epicureans, but also criticizes Posidonius' view that because they had simple tastes and a frugal lifestyle, early humans were natural Stoic philosophers: they had no choice but to live that way, and were not tempted otherwise; philosophy arises only when luxury creates temptation and forces a choice (see Russell, 1974, 91–3; Boys-Stones, 2001, 18–27 and 45–9). This would also be L.'s view: both Epicurean and Stoic ethics are products of civilization, and are much more necessary in a civilized setting; for L., more necessary since the rise of false opinions about the gods, and the concomitant excessive fear of death and punishment, led to the psychological instability that caused unlimited desires (see Introduction and on 1028 below; cf. 3.59 ff., 5.1120 ff., and 1161 ff.; Phld. *De Piet.* 265–70 Obbink). Posidonius, on Seneca's evidence, does explicitly claim the prehistoric humans for Stoic ethics. L. here claims them only obliquely. Perelli (1967, 159–60) compares the approach of Rousseau, in *Émile* and *La Nouvelle Héloïse*, who draws a contrast between modern prodigality and prehistoric frugality, but who, against his usual tough approach, invests prehistory with an idyllic colouring and gentleness. Blickman (1989, 163) notes that these lines on plenty and frugality are balanced by the negative topos of starvation at 1007–8, and that the separation of the two ideas enhances the positive feel. He speaks of a

> primitivist colouring. Without these lines, the whole description would lose its charm, and L. chooses his words carefully to leave the impression of modest desires that find abundant supplies without strenuous effort: *satis id placabat pectora donum* (938) sets this peaceable tone.

Clearly this sort of recruitment of prehistoric humans to serve pro tem., as it were, in ethical arguments is common, and is not indicative of any absolute value judgement placed upon their lives. In *Ep.* 90, Seneca, despite rejecting Posidonius' view, makes heavy use of prehistoric humans in his criticism of modern *mores*. Compare the similar use of Noble Savages (see L&B 287 ff.; Boas, 129, e.g. Cic. *Tusc.* 5.32.90, and Hor. *Carm.* 3.24 on the Scythians, Polyb. 4.19–21 on the Arcadians, and Agatharchides *De Mar. Eryth.* 49 on the Ethiopians. See now Boys-Stones, 2001, 18–27).

939. glandiferas . . . quercus: *glandiferas* is another seeming Lucretian coinage, not found in the extant fragments of Ennius, although it does have an Ennian feel (see above on 864–6). Cf. later uses by Columella 9.4.3; Pliny *NH* 22.94; Ov. *Met.* 12.328 (*TLL* 6.2.2028.74 ff.). For the Greek equivalent βαλανηφόρ-, cf. Ath. *Deipn.* 14.65.15; Hdt. 1.193.28 (of date palms); Eust. 3.158.4.

Acorns as the food of early humans, and of 'primitive' or 'barbaric' contemporary peoples, are one of the classic ancient memes of prehistory (replaced now for us by 'roots and berries'?), and a simple mention of them conjures up a wealth of associations with rude simplicity, Noble Savagery, and dietetic virtue. They are the defining diet of the Arcadians (Paus. 8.4), and of other mountain dwellers (cf. Strabo *Geog.* 3.3.7 Northern

Spain; Hdt. 1.66). This food of the first humans is both wild and raw (there is as yet no use of fire) and so defines them as bestial, uncivilized, and even Cyclopean (*Odyssey* 9.291), according to the traditional wild/tame and raw/cooked polarities of Greek anthropological thinking: wine and bread are the two defining foods for civilized people (see Segal, 1974; cf. *Il.* 4.35 and 24.207; Hdt. 3.99–100; Moschion *TrGF* 1.97 fr. 6.23–5; Prodicus DK84 B5; Eur. *Bacch.* 274–85; Cic. *In Verr.* 2.5.187). Acorns are still used as emblematic of a primitive lifestyle by certain villagers in Mexico, who deny that acorns are edible for humans, but attribute the eating of them to neighbouring mountain dwellers. So they are very much a sign of uncivilized 'otherness', and even bestiality: the monster in *Frankenstein* eats them (ch. 17, see Levine, 1989, 87 ff.). In mythology the acorn diet is replaced with grain crops by Ceres as culture-bringer (e.g. Verg. *G.* 1.147 ff.), or grasses and roots are replaced by acorns, and then acorns by cereals (e.g. Paus. 8.1.5–6; Varro *RR* 2.1.3). Ovid (*Fasti* 4.339), curiously, has acorns as the gift of Ceres.

The acorn diet idea is at least as old as Hesiod (*Op.* 233, see West ad loc.), and may even be a folk memory from a Western Eurasian pre-agrarian diet (Frazer, 1929, on Ovid *Fasti* 1.676; Mason, 1995, 12). It is found in Herodotus (1.66.2), Dicearchus (fr. 49 Wehrli), Theophrastus (π. εὐσεβ. fr. 2.25 ff.), and Diodorus Siculus (19.19.3) among very many others (see Appendix B; Gatz, 1967, 230 *glande vescentes*; *TLL* 6.2.2032.18 ff.; Boys-Stones, 2001, 14–17). Dicearchus (fr. 49 Wehrli) attributes the cry ἅλις δρυός ('enough of the oak tree!') to the first person to turn from acorns to the fruits of Demeter (L&B 95 n. 159; cf. Cic. *Ad Att.* 2.19.1). The oak tree itself had strong associations with ancient times, and was sometimes considered to be the most ancient of trees (Levine, 1989, 92–3). It also had strong Arcadian links (cf. Plut. *Cor.* 3.3; Stat. *Theb.* 4.275 ff.), and was venerated as ancient and even divine (cf. the oracular Oak of Dodona sacred to Zeus, Apollod. 1.97; Pausanias 1.17.5, 7.21.2, and 8.23.5). The magical and religious associations of the oak are also shown by the derivation of 'druid' from δρῦς (see Stanford, 1958, on *Od.* 14.327–8). In later Latin poetry the oak tree seems particularly to have strong links with the Golden Age, perhaps through the status of Arcadia as an intertemporal Golden Age (cf. Juv. *Sat.* 6.12–13; Verg. *G.* 1.147–9; Ov. *Met.* 1.106).

Acorns are edible (after leaching out the tannins and cooking), and may well have been an important part of early hunter-gatherer diet. They were a staple of Native North Americans until recently, and they are still one of the traditional Harvest Festival foods of Sardinia (as acorn cake, see Mason, 1995, 12).

curabant corpora has a strong positive dietetic feel, just as 'non magnis opibus iucunde *corpora curant*' does in 2.31, and 'non magnis opibus *iucunde corpora habebant*' in 1394 (cf. Apul. *Met.* 5.2; Celsus *Med* 1.2.5.5; Cic. *ND* 1.94.10; Homerus Latinus *Ilias* 109: 'et dapibus divi curant sua corpora largis', *TLL* 4.1504.29ff.), suggesting that the early humans were healthier on their raw, simple diet than we are (as in Hes. *Op.* 109ff.; Pind. fr. 143 Snell and *Pyth.* 10.29ff.; Dicearchus fr. 49 Wehrli; *Orac. Sib.* 1.283ff.; Pliny *NH* 4.89. Against this topos see Hippoc. *De Vet Med.* 3.26. See Appendix B, and Farrington, 1953, 59–62). It also helps to balance the negative topos of the lack of medicine, presented at 997–8, in much the same way as the topos of the spontaneous abundance of food is balanced by starvation at 1007–8 (see below). This mirrors the approach of Dicearchus (fr. 49 Wehrli), who attributes the health and mild characters of the early humans to their mild, simple vegetarian diet. Dicearchus also edges close to the topos of starvation, but transforms it into a health-giving fasting instead of a cause of death.

940–2. et quae . . . maiora ferebat: Verg. *G.* 1.148 (cf. 2.520), and Ov. *Met.* 1.104 both have arbute berries along with acorns as food in the Golden Age. Munro ad loc. notes that the Peloponnese is especially noted for the abundance of arbute berries in winter, and Giussani ad loc. considers that this could indicate that this detail is from Epicurus (see Blickman, 1989, 164 n. 22). However, Varro *RR* 2.1.3 ff. (cf. *RR* 5.963) seems to attribute the arbute berries to Dicearchus, although they do not appear in Porphyry's report (*De Abst.* 4.1.2, fr. 49 Wehrli), where acorns do, and so they may come to Varro from L. *Arbutus* is a traditionally pastoral tree, under which goats graze and shepherds (or poets) recline in the shade, and so perhaps the arbute berries, just as oak trees move easily between the two, have been attracted into the topography of prehistory through the temporally indeterminate Arcadian 'Golden Age' landscape (cf. Theocr. 5.129, and 9.11; Longus 2.16; Verg. *Ecl.* 3.82, and 7.46, *G.* 3.300; Hor. *Carm.* 1.17.5, and 1.1.21; Theophr. *HP* 1.5.2; Galen 12.34). The 'punic colour' of the arbute berries adds an exotic touch that aids the sense of bounty. Compare Tibullus' use of *puniceum* (2.3.57–8) as one of the exotic luxuries of the Iron Age (his anti-Golden Age).

The young earth provided larger fruits and in greater quantity: *plurima . . . maiora ferebat*, just as she was able to produce larger animals than today (see above on 799–800), and just as the first humans were larger (925 ff.), cf. 2.1105 ff. for the physical explanation. Thus, their ability to survive without agriculture, and in winter, is explained. With *hiberno tempore* L. introduces the theme of winter, and hints that, despite the reiteration of the spring-like theme of the flowery newness of the world at 943, either some deterioration in the climate, or a subtle change in his treatment is creeping in. A tougher landscape is foreshadowed, that is harsher, and now has seasons instead of the former constant spring. However, L. does not yet pass into a strongly negative mode: the flowers, and the greater size of the berries and their glowing colour soften the harshness of winter, and turns the traditional negative topos of winter starvation to his own advantage (Blickman, 1989, 163–4; cf. Diod. Sic. 1.8.6–7 (see Spoerri, 1959, 155–6); Eur. *Suppl.* 207–8, with Collard ad loc.).

943–4. multaque . . . ampla: *novitas tum florida mundi* reminds us we are still in the springtime of the world, and leads us into the pastoral landscape of 945–52 (cf. 2.1157 ff., see above on 783 ff.). *Pabulum* equates to χόρτος (animal fodder) as opposed to σιτίον (*cibus*) for human food (LSJ s.v. σιτίον II.2, *TLL* 3.1038.80 ff.). *Pabulum* is used especially of fodder for grazing animals (its root is from *pasco*), but it can be used for human food, and figuratively for other sorts of 'nourishment', cf. 4.1063 *pabula amoris* (*OLD* s.v. *pabulum* 2). Here L. stresses the bestial nature of his first humans (see above on 939), and introduces obliquely the theme of grasses and roots as the first human food (see Appendix B). In one tradition grass is replaced by acorns and then by grain crops. In another, acorns appear as the first human food and are replaced by cereals, or by grasses and fruits. Acorns, and woodland products generally, may all appear as the earliest diet (see above on 939), cf. Hippoc. *De Vet. Med.* 3.26: *καρπούς τε καὶ ὕλην καὶ χόρτον* ('fruits and wood and grass'). Diodorus Siculus has his early humans selecting the tenderest grasses, cf. 1.8: *τῆς τε βοτάνης τὴν προσηνεστάτην καὶ τοὺς . . . καρπούς* ('the tenderest of grasses and fruits').

The Stoic Balbus uses similar language in describing the workings of providence, cf. Cic. *ND* 2.121: 'pastum autem animantibus large et copiose natura eum qui cuique aptus erat comparavit'. L., by using the language of the providentialists, and by the attribution of an animal diet to humans, implicitly argues against the view that each creature has its own proper food providentially chosen for it. Compare the extraordinary *tour de force* of appropriation of providentialist language at 2.991 ff. (for the *hieros gamos* see above on 799–800, and Fowler, 2000*a*, 138–55), esp. 2.994–7 'arbustaque laeta | . . . parit . . . | pabula . . . pascunt | prolemque propagant'.

This *pabula* is now *dura*, matching the prehistoric humans and the earth herself (926). Contrast the *pabula laeta* of books one and two; a phrase associated with creation (see above on 868–70): 1.14 of the meadows of the Venus proem, 1.257 and 2.991 of the bounty of the Earth-Mother, 2.317 and 2.364 in spring vignettes, of the creative power of the earth, 2.875 of the creative power of the atoms, and 2.1159 the original fruits of the earth. The shock contrast of *dura*, with *novitas tum florida mundi* setting us up for *pabula laeta*, rationalizes the Golden Age myth: the young earth was bountiful, but her bounty was harsh. The language of the myth still aids L.'s argument, but just as with the palinode at 2.644 ff. after the *Magna Mater* ecphrasis, *dura* supplies the true picture.

We may read *miseris mortalibus ampla* in perhaps three separate, but associated, ways:

1. The bounty of the earth was *ample* (as we should expect from the background tradition).
2. This coarse fodder was *quite sufficient* for these tough bestial early humans (thus, they were able to survive without fire and cooking).
3. The simple products of the bountiful earth are enough to satisfy any person's real needs (even today. See above on 938).

944. miseris mortalibus: a Homeric epic phrase, cf. *Il.* 22.31 *δειλοῖσι βροτοῖσιν*, and Vergil's *mortalibus aegris* at *A.* 10.274, both of the Dog-star bringing plague, cf. *DRN* 6.1, and 6.1152 for uses of the phrase in the plague context.

Lines 945–952: a pastoral ecphrasis

Now that food, the first of the natural and necessary desires of the first humans, has been satisfied (937–42), L. turns to the second: the slaking of thirst (Schrijvers, 1994, 294). This is treated in a similar but even more positive and attractive manner, in an ecphrasis that goes far beyond the needs of the rational argument: 'the first people drank water from streams'. L. balances the sections on food and drink with eight lines each, and since the prehistoric satisfaction of thirst could be explained more easily than that of hunger, he thus provides himself with an opportunity to paint a pastoral picture of the lives of early humans. Springs and streams are a frequent *locus amoenus* of pastoral poetry (Gale, 1994, 170 compares Theocr. 1.1–8, 5.33, 7.136 f.; Verg. *Ecl.* 1.51 f., and 7.45), and here the pastoral and Golden Age landscapes merge into one another, with the streams of wine, milk, and honey simply replaced by their counterparts in pastoral poetry (on L. and pastoral see esp. Giesecke, 2000, 31–58). The earth provides a plentiful bounty, but of water rather than wine. As E. J. Kenney notes (1972, 14): 'The dominant idea in these verses is that of plenty.' In this way L. appropriates an entire genre of poetry, and uses it to debunk the Golden Age. Of course, the switch between the two is made far easier by the close relationship between pastoral and prehistory. This perhaps is seen most clearly in the temporal and ontological instability of Arcadia, which is at the same time the setting for the earliest proselenic humans, a real place, and an encapsulation of present and future yearning for the simple life. In Arcadia, prehistory and present-day cultural primitivism are inextricably linked (see Schrijvers, 1999, 95–6; L&B 344–8; cf. Aristoph. *Nub.* 397; Xen. *Hell.* 7.1.22 ff.; Ap. Rhod. 4.264, see further below on 973 ff.).

The attractiveness of these lines has led some commentators to see L. here positively praising a prehistoric life lived close to nature, and even to the attribution of a rudimentary religion of nature to the first humans (cf. Giancotti, 1989, 176–7; Perelli, 1967, 160–1). However, as with the treatment of food, care is needed in separating out L.'s 'medicine' from its attractive packaging: accretions of positive moral judgements will adhere to the themes L. appropriates, and will aid the transmission of the message of 'cultural gradualism'. The virus 'culture by divine providence' is hollowed out and refilled with 'cultural gradualism': 'cultural gradualism' now takes on the appearance and attractiveness of 'culture by divine providence' and vaccinates the reader's mind against the latter. Accordingly, no absolute value judgements are placed upon prehistory by the recruitment of pastoral poetry to serve L.'s arguments: the positive value judgements adhere to pastoral directly, and to the first humans only indirectly.

The picture is complicated by L.'s giving these themes an Epicurean twist, and so going one stage beyond the simple vaccination technique: the lifestyle of primitive people is used to both legitimate and illustrate Epicurean ethics. As Posidonius does (fr. 284 E–K, Sen. *Ep.* 90, see introduction to 925 ff.), L. recruits prehistoric humans to serve pro tem as proto-Epicureans. They are not philosophers, but they represent in their ethics a state both pre-existing philosophy, and one that may be achieved through philosophy in the future (cf. Diogenes of Oinoanda fr. 56 Smith). Thus, positive value judgements do attach to them, but in a limited and temporary way: they may at one time be picked up and used, as here, to illustrate the Epicurean ethical insistence that the real needs of the body are easily satisfied, a role in which they are moral exemplars, and then at another be exhibited in a negative way to illustrate another side of Epicurean ethics (cf. 958 ff.). Didactic and ethical concerns dominate, and the prehistoric people may take on different roles, but without being fundamentally altered: different aspects of their character and lifestyle are stressed, and the very landscape in which they wander shifts under their feet, but it is really only our view of them that changes.

This theme of water drinking echoes the cultural primitivism of the Epicureans even more directly than the theme of the simplicity of the first food, since water is the Epicurean drink *par excellence* (cf. Epicurus fr. 181 Us.; Diog. Laert. 10.11; Sen. *Ep.* 21. 10), and thus the bestial first humans are seen behaving in a manner similar to that of the Epicurean philosopher, and also of the Cynic and Stoic philosopher (cf. Sen. *Ep*. 90.44 ff., the passages collected in L&B 117–54 'Cynic Primitivism'; and see Perelli, 1967, 160; Cole, 1990, 150; Boys-Stones, 2001, 18–27). Seneca uses the same topos in the same way in prehistory, cf. *Ep*. 90.43:

> spiritus ac liber inter aperta perflatus et levis umbra rupis aut arboris et pellucidi fontes rivique non opere nec fistula nec ullo coacto itinere obsolefacti, sed sponte currentes et prata sine arte formosa.

Cf. Sen. *Phaedra* 518–20, of present-day ethics:

> sollicito bibunt
> auro superbi; quam iuvat nuda manu
> captasse fontem!

The picture is also reminiscent of the Epicurean picnics at 5.1390 ff. and 2.29 ff., where the simple delights of lying by the banks of a stream, sated with easily procured simple fare, are lauded in ecphrases set both in the past (5.1390 ff.) and present (2.29 ff.) (see Fowler, 2002, ad loc.). Costa on 5.1390 ff. compares Hes. *Op*. 588 ff.; Theoc. 1.21–3; Moschus 5.11 ff.; Hor. *Carm*. 1.1.21–2, *Epod*. 2.23 ff., and *Epist*. 1.14.35; Verg. *Ecl*. 8.87; Tibull. 1.1.27–8 and *Culex* 68 ff.

Lines 945–952: drink

945. sedare sitim fluvii fontesque vocabant: nature, in the form of the springs and streams, is personified (Blickman, 1989, 164) and given a quasi-religious function in summoning the first humans to drink. The first humans are presented as if living in intimate communion with nature, and follow the voice of nature in satisfying their natural and necessary desires in a simple, natural way, according to the Epicurean doctrine of pleasure (cf. Perelli, 1967, 160; L&S 21A–X). The personification of nature both serves to explain how the first humans were able to discover water and slake their thirst, and rationalizes mythical and religious ideas of the numinous status of springs and streams (Schrijvers, 1994, 294–5, cf. the explicit explanation for such mistakes at 4.580 ff.): the voice of 'nature' is actually that of the rushing water itself. Thus, the voice of the stream provides the model for where and how to find water (Perelli, 1967, 161), and so in this way, nature is the teacher of the first humans, in accordance with Epicurus' description of the process of learning; firstly from reality itself, and then by the application of reason (cf. *Ep. Hdt.* 75.1–6. See Manuwald, 1980 and my introduction to 5.925 ff.). The idea of nature as teacher is very much part of the rationalist programme, and serves an anti-teleological function, arguing against ideas of the divine granting of the necessities of life (see Appendix B). In the same way, we see *natura creatrix* providing the *specimen* for sowing and planting (5.1361 ff.). On this theme, Democritus (DK68 B154) gives imitation of the animals as the origin of technologies: the spider's web for weaving, the swallow for architecture, and the swan and nightingale for singing (cf. *DRN* 5.1379 ff., and see Cole, 1990, 57).

946. ut nunc montibus e magnis: we are given a diachronic analogy between the behaviour of wild animals and the first humans (Schiesaro, 1990, 128). The mountain theme (see Appendix B) and the wild beasts are actually here in the present, and so we see the atemporal association between 'primitive' people and wild mountain regions that we find in many prehistories and in geography, especially in descriptions of Noble Savages (see L&B 287 ff.). The mountain motif also serves to underline the bestial nature of the early humans in a less positive way, as the mountains are always the haunts of wild beasts as well as 'savages', whether noble or otherwise (see on 824 above).

947. claru' citat late: O and Q give *claricitati a te*, emended by Bosius to *claricitat late*, and by Forbiger to *claru' citat late*, which has, despite the unusual adverbial *clarus* (but cf. Verg. *A.* 7.141–2), the necessary sense of nature summoning creatures to drink, echoing *vocabant* in 945. Compare 4.710–11: 'gallum . . . | auroram consuetum clara voce vocare'. Seneca gives a very Lucretian picture of the delights of the simple life, both available today, and as lived by early humans (the whole passage is one of the Lucretian classics for the inter-temporal fusion of the 'natural life' and the Golden Age), *Phaedra* 510 ff.:

> iuvit aut amnis vagi
> pressisse ripas, caespite aut nudo leves
> duxisse somnos, sive fons largus *citas*

> defundit *undas* sive per flores novos
> fugiente dulcis murmurat rivo sonus.

Seneca gives some support for *citat*, but transfers the swiftness contained in the root of the word to the *undas*. Compare the same technique with his *vagi* of the stream with L.'s *vagis* of the people, and his prosaic *fons largus* for *proluvie larga*.

sitientia saecla ferarum: *saecla ferarum*, L.'s favourite periphrasis for *ferae*, occurs twelve times: 2.995, 2.1076, 2.1152, 3.753, 4.413, 4.686, 5.947, 5.967, 5.982, 5.1059, 6.766, 6.1220, and not found in Latin elsewhere. The Greek equivalent line ending is found in Empedocles DK31 B26.4: *ἔθνεα θηρῶν*, and then later in Opp. *Cyn.* 3.1; Nonnus *Dion.* 1.233; Quintus Smyrnaeus *Post.* 5.248; but similar phrases are also found, e.g. Soph. *Ant.* 344: *θηρῶν ἀγρίων ἔθνη*. Empedocles Strasbourg fr. a(ii) 26 M&P has: *θηρῶν ὀριπλάγκτων ἀγ[ρότερ' εἴδη]* translated by L. at 2.1081 as: 'montivagum genus . . . ferarum' (see M&P 233–4). *Genus . . . ferarum* caught on while *saecla ferarum* did not, cf. Verg. *G.* 3.242, 4.223; Ov. *Met.* 10.705; Stat. *Theb.* 5.391; Manilius *Astron.* 2.777; Calpurnius *Ecl.* 2.10.

The behaviour of the first humans is again compared to that of wild beasts. They were drawn to the water in the same way as animals are now, without the need for the application of reason to the problem of where to find it. The picture is not one of humans learning by observing and following the animals, as we might expect from Democritus (DK68 B154, see Cole, 1990, 57) and from L.'s description of the origins of music from imitation of bird song (5.1379 ff.), but a direct animal-like response to a natural stimulus. Blickman sees this comparison to wild beasts as suggesting more 'simplicity than savagery' (1989, 164), and certainly the placing of the comparison in such an attractive context does much to undercut the traditional pejorative force of the *θηριώδης βίος*.

Lines 948–952

L. underlines the bounteous plenty of the earth, giving copious draughts of healthy water, with a flurry of liquid words, aided in their effect by the repeated 'lu' and 'la', 'a' and 'u' sounds introduced and marked in their meaning by *umori' fluenta*, and the splashy 's's of the repeated *saxa*, *super*, *stillantia*, *musco*, and *scatere*. There is so much water that, in its rush down from the high mountains, it bursts out of the woods into the fields below with the plosive 'p's of 952. This poetic *tour de force* is not simply for effect, nor does it show a tension between poetry and philosophy (as in Williams, 1968, 646, and Costa ad loc.), but greatly aids the rationalization of ideas of Golden Age plenty: the earth did indeed give freely of her great bounty in the past, but her bounty was in streams of water, not wine. The repetition of *umida saxa* constitutes an *epanalepsis* (see Wills, 1996, 124ff., who lists eight examples in L.: 2.159–60, 2.955–6, 3.11–12, 3.12–13, 5.298–9, 5.950–1, 5.1189–90, and 6.528–9 (and perhaps add 4.789–90, and 5.1327–8)). Costa notes that this 'combined double repetition is unique in the *DRN*' and that L.'s usual technique is to repeat a word from the fifth foot in the first foot of the following line. There is, however, one other example of repetition from the sixth to the first foot, cf. 5.298–9: *instant* | *instant*, and one repetition from the fourth to the first, cf. 4.789–90: *mollia membra movere* | *mollia*). This repetition of *saxa* is echoed by Verg. *A*. 1.108–9:

in saxa latentia . . .
saxa vocant Itali mediis quae in fluctibus aras

(see Wills, 1996, 168). Cf. also Verg. *A*. 12.896–7, Val. Flacc. 4.641–2.

Here the repetition is certainly 'suggestive of the plashing of water on the stones' (Gale, 1994, 170, cf. Costa ad loc.), but also has the further function of separating out the components of the stream and its sounds. West (1969, 89) identifies three sounds (as I interpret his description): the smooth washing of the stream, the dripping of the rocks, and the fierce gushing onto the plain. However, against his punctuation, I (following P. G. Fowler, 1983, 631–2) would take the second *umida saxa* with *super viridi stillantia musco*: 'washed the wet rocks, the wet rocks dripping above with green moss', cf. 6.942–3: 'saxa superna | sudent umore et guttis manantibu' *stillent*'. Calpurnius, in his version, uses the same technique and imagery, *Ecl*. 6.65–7:

si placet, antra magis vicinaque *saxa* petamus,
saxa, quibus viridis *stillanti* vellere muscus
dependet . . .

Thus, the effect of the *epanalepsis* is to introduce a pause after the second *umida saxa* (P. G. Fowler, ibid.) and so to draw our eyes and ears aside from the onrush of the torrent, to the quiet pools at its margin and their overhanging dripping moss-covered rocks, before the peaceful interlude is ended by the switch to view the rest of the stream (*partim*) rushing on to burst out of the pool and down onto the plain in a waterfall (as often in Claude Lorrain, cf. *The Judgement of Paris*, 1645–6, and *Landscape with Nymph and Satyr Dancing*, 1641). There is thus no need to see two separate streams (as do Bailey and Costa ad loc.), one in the groves of the nymphs, and one in the plains, and both *scibant* and *quibus e* can govern all three verbs *lavere . . . scatere . . . erumpere*.

It may not be too fanciful, given the frequency of the mountain/woodland theme as symbolic of primitive simplicity, to see the descent of the stream from the mountains to the plains as echoing the progress of humanity from wild to tame. Certainly Plato (*Laws* 3.678c ff.) stresses such a descent from the hills as the journey to civilization, and L. himself speaks of the beginnings of agriculture as a driving of nature back up into the hills (5.1370 ff.). Compare Vergil's description of the beginning of the Saturnian Golden Age, in *A*. 8.319–22:

> Primus ab aetherio venit Saturnus Olympo,
> arma Iovis fugiens et regnis exsul ademptis.
> is genus indocile *ac dispersum montibus altis*
> *composuit* legesque dedit . . .

948. nota vagis: thus OQ. Lachmann objects that the wanderers would not *know* these groves in their aimless wanderings, and emends to *vagi*; but while we may deny them reason, we can allow them memory (cf. on *tenebant* below). Indeed they can learn, if only directly from nature (*Ep. Hdt.* 75.2 ὑπὸ αὐτῶν τῶν πραγμάτων), and so memory must be present. This does give some focus for their wanderings, but they are still characterized by a certain aimlessness. Modern humans are still thought to have been distinguished from archaic humans by their greater ability to direct their motions and actions.

Erik Trinkhaus considers:

> The leg bone anatomy of Neanderthals implies that they spent a significant proportion of their waking hours moving continuously

> across the landscape . . . Archaic humans lacked the planned subsistence patterns characteristic of recent hunter-gatherers and hence a high degree of minimally directed movement during the food quest. (Lewin, 1998*a*, 130)

948–9. silvestria templa . . . | nympharum: with this reference to the nymphs and their rocky haunts, L. places his wanderers firmly in a traditional numinous pastoral landscape at least as old as Homer, and defined for us by Theocritus, where nymphs, caves, pools, and springs are definitive features. Costa compares *Od.* 12.318 and 13.104; Theoc. 7.136–7; and Verg. *A.* 1.167–8 (see Williams, 1968, 641–2), and notes the traditional association of nymphs with caves. Bailey and Costa (ad loc.) prefer to grant no religious force to *templa*, although the latter does admit that with *nympharum* the sense 'temples' is hard to avoid. Schrijvers (1994, 295) rightly disagrees and points out the similarities with the cave of the nymphs in *Od.* 13.103, and sees an ironic demythologizing of the topos in the use of this phrase, with the numinous temples of the nymphs revealed as nothing more than the haunt of primitive humans. There is, further, no need to see as Giancotti does (1989, 176–7) 'un rispecchiamento di mitiche credenze, d'una primordiale religione da lui attributa agli uomini dell'erramento ferino'. The first humans had no religious misconceptions, and were quite incapable of seeing things except as they really are (see Introduction, cf. *DRN* 5.1169 ff.; Phld. *De Piet.* 225–31, 265–70, 519 ff., Obbink; Sext. Emp. *Adv. Math.* 9.25 = fr. 356 Us. See Obbink, 1996, 306–7, and 1995, 197 ff.). Any religious associations are in the reader's mind: by placing his first humans in a mythological landscape L. exploits a ready-made association between caves, woods and primitive humans, and caves, woods, and nymphs in magical blessed landscapes, and turns it to his own rationalizing purposes. Inevitably, some of its religious associations still adhere. This linking of the primitive and the blessed landscapes is of course very ancient, and clearly seen in the description of the life of the Cyclopes in *Od.* 9.106 ff., who live a Golden Age existence in a blessed land, but have no laws or co-operation, and live in caves.

tenebant: this may have something of both the meanings 'remember' and 'inhabit': as well as being drawn naturally to the sound of water, they had come across streams and pools by accident in their wanderings, which they then remembered (*nota vagis*) (Schrijvers, 1994, 295), cf. 2.1090 'quae bene cognita si teneas'; or simply inhabit, cf. 4.591–2: 'ne loca deserta ab divis quoque forte putentur | sola tenere'. The motif of discovering water by chance would seem fitting in an account that explains the acquisition of the necessities of life by trial and error, but, short of allowing them reason, we may grant the early humans some intellectual abilities (see on *nota vagis* above).

Lines 953–957: further lack of technologies

After the attractive picture of prehistoric sylvan thirst-quenching, we are given a less positive picture of the lives of early humans. We have been told that the first humans had no farming technology (933–6), and now we find several further classic topoi of prehistory: lack of fire, lack of clothing, and living in caves, mountains, and woods (see Appendix B). We have not yet moved into a negative picture, since traditionally each of these topoi may have both positive and negative associations. They are necessary, however, in the gradualist view of culture history, since all things must be learned in stages. Their moral weighting is flexible, and here in these few lines we move from an idyllic springtime vignette to harsh winds and storms. This helps provide a balance with the previous *locus amoenus*. Both versions may be true, and, even juxtaposed, both are available for didactic use (see introduction to 925 ff.), and do not conflict.

953. necdum res igni scibant tractare: the technique of description by negation is resumed from 933–5 (cf. 929–30, 958, 973, 979–80, 988, 999, 1004). Here, clearly, with *necdum* we are given the classic comparison with the present day (Schrijvers, 1994, 292; Schiesaro, 1990, 131) and so L. need not be arguing against any notion that the earliest humans did have fire. The idea that the first humans had no fire is the default view; Pl. *Leg.* 3.676 ff. ducks the question (see Appendix B). L. explains the discovery of fire at 1091 ff. (see below).

953–4. neque uti | pellibus et spoliis corpus vestire ferarum: the lack of clothing is again standard (see Appendix B), cf. Ov. *Fasti* 2.298, ironically: 'ibat ovis lana corpus amicta sua'. Varro *RR* 2.1.3 ff. also places the beginnings of skin-wearing in prehistoric landscape where the climate is the same as today, and the remaining references to climate in prehistory from this point on all refer to storms or cold, except for the picnic of 1391 ff., which takes place in spring (i.e. 1002–3, 1015–16, 1192–3, and 1426–7). Cf. Diod. Sic. 1.8.6–7; Sen. *Ep.* 90 (Posidonius fr. 284 E–K); and Diogenes of Oinoanda fr. 12.I.1–4 Smith (but note Smith's reconstruction of lines 1–2 is influenced by this passage of Lucretius). The theme of woods for shelter and of beds of leaves is, again, one of the standard features of the ancient prehistoric/primitive landscape (cf. on 972 below, 1417: 'strata cubilia sunt herbis et frondibus aucta'; Ov. *Ars Am.* 2.475; Sen. *Ep.* 90; Ps. Callisthenes *Gesta Alex.* 3.9–14; Ctesias *Indica* 23). L. separates them out, with bushes for shelter here, and beds of leaves at 972 ('circum se foliis ac frondibus involventes') and 987 ('instrata cubilia fronde'). Cf. Ov. *Fasti* 2.293: 'pro domibus frondes norant', *Ars Am.* 2.475: 'silva domus fuerat, cibus herba, cubilia frondes'.

956. squalida membra: Bailey ad loc. interprets this as roughened by exposure to the elements. This would seem to be similar to the view taken by Rousseau (*2nd Discourse* pt. 1) that the first humans were toughened over time by exposure to the rigours of their wild woodland life, and also of the Cynics that early humans were tougher than we are today because they became inured to the harshness of their lives (see L&B 117 ff.; Cole, 1990, 150). However, L.'s first humans are already tough because of their earth origins (cf. 925–30), and so would seem to need no further toughening. This would suggest that their *membra* are *squalida* because of their fundamentally animal-like natures rather than from roughening from exposure. Schiesaro sees this as a reference to the greater hairiness of primitive humans (1990, 128 n. 15), and compares Ov. *Fasti* 2.181: *ursa . . . squalida.* This hairiness seems to be confirmed by 'saetigerisque pares subus silvestria membra' (970). L.'s only other use of *squalidus* is for the roughness of certain atoms, cf. 2.469–70:

> scilicet esse globosa tamen, cum squalida constent,
> provolvi simul ut possint et laedere sensus

The Cynic view is that the process of softening undergone by civilized people can be reversed, and that we could once again live without the comforts and protections of civilization (cf. Lucian *Cynicus* 12 ff.; Maximus Tyrius *Diss.* 36; L&B 117 ff.). This toughening process seems to be suggested by L. at 1350–60 where men leave weaving to women and take up agriculture, thereby toughening themselves (see also on 933 above).

Lines 958–961: lack of justice

As I say above (Introduction), one dominant concern of L.'s prehistory, along with establishing the gradual non-teleological acquisition of arts and technologies, is the origin of justice. Here the lack of justice prepares the reader for the description of its origin in the first societies. Therefore these lines should be read closely with 1011–27.

L. describes the non-existence of social relations between early humans. They do not simply fail to co-operate with one another; they are, in fact unable to co-operate (*nec . . . poterant*), and they will not acquire the ability to do so until they are softened by fire, sex, child-care, and settled family life at 1011–27 and have evolved into fully modern humans (see below, and Algra, 1997, 141–2). As yet they are still wandering separately over the fields and through the woods, without laws or customs, competing with one another for food. There is no marriage (cf. 962–5, 1011 ff.), and no communication by spoken language (Giancotti, 1989, 172 ff., but see below on 1028 ff.). This adds a further dimension to the inability to co-operate. However (if we do not accept Marullus' placing of OQ's line 975 here, see on 968), the picture is one more of selfish a-social behaviour than aggressively anti-social behaviour (Mitsis, 1988, 83): there is no justice in their world, but this is not yet disastrous. This passage is much milder than the descriptions of prehistoric violence later in the book (Blickman, 1989, 164 ff.), cf. 1245–6, 1283–5, and 1416–22. Blickman calls these lines 'a deliberate whitewash of the earliest violence' (1989, 166); a treatment that enhances the 'primitivism' of the first stage of prehistory, but it should be recognized that the amount of violence in prehistory is as much a matter for conjecture for L. as it is for us; our Darwinian preconceptions should be examined in this respect, and recent Darwinian game-theory gives a far more co-operative picture (see on the 'prisoner's dilemma' 1011–27). Especially, there is little obvious hint here of the behaviour that would have caused the destruction of the human race, had we not softened and begun to make friendship pacts, as described in 1026–7 (see below). On the other hand, Perelli (1967, 166–7) puts together the above passages with Hor. *Sat.* 1.3.99 ff. to produce a picture of extreme violence in L.'s prehistory, that he regards as capable of leading to the destruction of the human race. However, the rationalist tradition of prehistory often gives much more violent pictures of primeval life, cf. Moschion *TrGF* 1.97 fr. 6.14–16:

> *βοραὶ δὲ σαρκοβρῶτες ἀλληλοκτόνους*
> *παρεῖχον αὐτοῖς δαῖτας· ἦν δ' ὁ μὲν νόμος*
> *ταπεινός, ἡ βία δὲ σύνθρονος Διί·*

The flesh of their fellows was men's food. And law was humble, and brute-force was enthroned with Zeus.

Horace and Cicero give Lucretian-influenced views, but both stress the violence more strongly, cf. Hor. *Sat.* 1.3.100 ff.:

> glandem atque cubilia propter
> unguibus et pugnis, dein fustibus, atque ita porro
> pugnabant armis quae post fabricaverat usus.

Cicero reads more violence into these lines, *Sest.* 42.91:

fusi per agros ac dispersi vagarentur, tantumque haberent, quantum manu ac viribus per caedem ac vulnera aut eripere aut retinere potuissent.

(Cf. also Grat. Fal. *Cyn.* 2 ff.; Critias *Sisyphus TrGF* 1.43 fr. 19; Diod. Sic. 1.90.1 reporting an Egyptian prehistory.) Nor are L.'s primeval humans cannibalistic as in Moschion (cf. *Od.* 9.106 ff., Pl. *Leg.* 782c 1 ff. and *Plt.* 271 ff.; Moschion *TrGF* 1.97 fr. 6; Athenio *PCG* fr. 1; Orphica fr. 292 Kern; Hor. *Ars* 391 ff.; Strabo 7.3.9; Diog. Laert. 6.73, and 7.7.121). The simple lack of co-operation between primeval humans, rather than outright violence, that L. gives here is close to Diod. Sic. 1.8.1.3–4:

τοὺς δ' ἐξ ἀρχῆς γεννηθέντας τῶν ἀνθρώπων φασὶν ἐν ἀτάκτῳ καὶ θηριώδει βίῳ καθεστῶτας σποράδην ἐπὶ τὰς νομὰς ἐξιέναι,

But the first men to be born, they say, led an undisciplined and bestial life, setting out one by one to secure their sustenance . . .

Cf. the strongly Lucretian-tinged Ov. *Ars Am.* 2.476:

> silva domus fuerat, cibus herba, cubilia frondes,
> *iamque diu nulli cognitus alter erat*

Vitruvius assumes the first humans lived scattered solitary lives, and describes how the discovery of fire was the cause of the first human gatherings, *De Arch.* 2.1:

> Ergo cum propter ignis inventionem conventus initio apud homines et concilium et convictus esset natus, et in unum locum plures convenirent . . .

The lack of law is a theme of both rational and mythological prehistory. Here we have a negative picture, but a mild one, with the lack of law associated with a complete lack of social interaction. It is also a feature of the Golden Age, and of Noble Savagery, in which 'primitive' peoples put civilization to shame by the peace and harmony of their lives achieved without the restrictive legislation necessary to restrain violence and disharmony among civilized peoples (see Appendix B, and L&B 287 ff.; cf. Ov. *Met.* 1.90–3; Tac. *Ann.* 3.26; Agatharchides *De Mari Erythraeo* 49 (on the Ethiopians, cf. *Il.* 1.423–4); De Léry *Histoire* ch. 8 (on the Tupinamba of Brazil)). Schrijvers (1994, 295) notes the similarity of these lines to *Od.* 9.108 ff. on the land of the Cyclopes. They live in a blessed land where all foods spring up spontaneously, live in caves (see on 955 above), and have no laws or social contact with one another, cf. *Od.* 9.112–15:

> *τοῖσιν δ' οὔτ' ἀγοραὶ βουληφόροι οὔτε θέμιστες,*
> *ἀλλ' οἵ γ' ὑψηλῶν ὀρέων ναίουσι κάρηνα*
> *ἐν σπέεσι γλαφυροῖσι, θεμιστεύει δὲ ἕκαστος*
> *παίδων ἠδ' ἀλόχων, οὐδ' ἀλλήλων ἀλέγουσι.*

> They have no assemblies for the making of laws, nor any established legal codes, but live in hollow caverns in the mountain heights, where each man is a lawgiver to his own children and women, and nobody has the slightest interest in what his neighbours decide. (Trans. E. V. Rieu)

Schrijvers also (1994, 295 n. 18) compares Pl. *Leg.* 3.680b and Arist. *Plt.* $1252^{b}19$ for similar uses of this Homeric description to characterize the: 'vie asociale des premiers temps'.

The Cyclopes embody the tension between Golden Age and Noble Savage ideas of the consequences of the lack of law. On the one hand, they live a blessed life in peace and tranquillity, without laws, but on the other, they are the most savage and dangerous of all creatures. Their peace is maintained by the lack of contact between one another, and their violent cannibalistic antisocial behaviour is apparent only in their interaction with outsiders (see Buffière, 1956, 359ff.). This tension is illustrated by the later use of the term *Κυκλώπειος βίος* both for a disordered life (Schrijvers, 1994, 295 and n.19), and for a blessed life of ease (cf. Strabo *Geog.* 11.4.3.7 and *Chrestomathia Straboniana* 11.21 of the Albanians). L.'s primitive humans share in this tension, with their food supplied spontaneously, and their robust constitutions, but here it is made clear that their lack of law is not an admirable feature of their lives. They, like the Cyclopes, also seem to be pictured as solitary individuals who simply do not pay any attention to each other. Thus, there is in fact no common good, nor can there be any such notion until the formation of the first settled societies.

Although L. gives a milder picture of primeval violence than some ancient anthropologists, his is a more extreme picture of the lack of co-operation among archaic humans than most modern anthropologists would accept. However, Lewis Binford does give a similar idea:

> Archaic humans were little more than opportunistic scavengers, grabbing what they could from carnivore kills, perhaps occasionally bringing down small prey. . . . (Lewin, 1998*a*, 130)

It seems that one of the advantages that early modern humans may have had over Neanderthals was their greater degree of co-operative ability. This, especially, allowed them to hunt co-operatively, kill large game, and so out-compete (or rather, out-co-operate) the Neanderthals, and drive them to extinction (Lewin, 1998*a*, 130–1). This view of Neanderthal and other archaic humans' lack of hunting ability is certainly borne out by the archaeological evidence. Until recently, it had been widely assumed that collections of animal bones found amongst stone tools indicated a very ancient hunting economy, but it now seems more likely that such conclusions cannot be supported, and that scavenging and the sharing of sites with carnivores could well account for the phenomenon (see Lewin, 1998*b*, 351ff. 'Hunter or Scavenger?'). The first hints of hunting appear in the archaeological record between 100,000 and 35,00 years ago (Lewin, 1998*a*, 130), but systematic hunting coincides with the origin of modern humans about 40,000–35,000 years ago. However, the Neanderthals certainly possessed some degree of co-operative ability, as shown by their burials of their dead, which also show signs of care for the injured (Lewin, 1998*b*, 365 ff.). Further, co-operation in food sharing and hunting is a feature of modern primates such as chimpanzees (Matt Ridley, 1996, 97), and so it may be reasonable to suppose archaic humans had the same, or a greater, co-operative ability. Whatever the exact degree of co-operation possessed by archaic humans, it is clear that they were not solitary creatures, as L., Diodorus, Vitruvius, Ovid, and Cicero describe them.

The question of primeval violence is clearer, and L. is quite correct to take a more moderate line here than Moschion does. The archaeology of warfare disappears beyond the Neolithic (*c.*10,000 years ago), and although there are signs of warfare and violence in paintings and engravings from between 5,000 and 10,000 years ago, these signs vanish before the agricultural revolution. Lewin suggests violence is a modern adaptation to certain circumstances:

> Warfare, so important a part of human history, is associated with the need for territorial possession that arose once populations became agricultural and necessarily sedentary. (Lewin, 1998*a*, 132)

This is in line with much ancient thinking (see Appendix B, and below on 999–1000).

958–9. nec commune bonum . . . | moribus . . . legibus: a phrase that resonates with a great range of ancient prehistoric speculations. Both 'as yet they were not able . . .', as in the rational traditions (cf. Critias *Sisyphus TrGF* 1.43 fr. 19; Pl. *Prt.* 320c ff.; Moschion *TrGF* 1.97 fr. 6; Verg. *A.* 8.315), and polemically against the prehistoric justice of the Hesiodic, Aratean, Dicearchan, etc. traditions: 'no, they were not able . . .' (cf. especially Hes. *Op.* 109 ff.; Pind. *P.* 10.29 ff.; Empedocles DK31 B128 and B130; Pl. *Plt.* 271 ff., *Leg.* 3.678c; Aratus *Phaen.* 96 ff.; Dicearchus fr. 49 Wehrli; and Posidonius fr. 284 E–K (Sen. *Ep.* 90); see Boys-Stones, 2001, 3–27). Cicero gives a more violent but essentially similar version, *Sest.* 91–2:

> neque civili iure descripto . . . tantumque haberent quantum manu ac viribus per caedem ac vulnera aut eripere aut retinere potuissent . . . tum res ad communem utilitatem . . .

In the Epicurean context of the foundations of justice in friendship and co-operation, the association between injustice and competition is of course pointed (cf. *KΔ* 31–40; *DRN* 3.59 ff., 5.1120 ff.; see below on 1011–27). Manilius, in his Stoicizing reply to L.'s prehistory, appropriates and 'turns' it, with competition now as the force driving the *commune bonum*, 1.82–4:

> seducta in varias certarunt pectora curas
> et quodcumque sagax temptando repperit usus
> in *commune bonum* commentum laeta dederunt

960–1. quod cuique . . . valere et vivere doctus: clearly there is no sign here of any innate affection or φιλαλληλία between the first humans (Perelli, 1967, 166 ff.) that we find in Stoic and Aristotelian theories (see further on 1011–27).

L. also argues obliquely against ideas of prehistoric communism (see Appendix B), with a lack of sharing of any kind. The point of view shifts here and we are allowed a glimpse of the primeval human thought processes, cf. Manilius' version, *Astron.* 1.78: 'se quisque satis novisse *putabant*'. L. does not legitimate selfish behaviour as a survival strategy, and a note of irony creeps in with *doctus*. These people have been to 'the University of Life' and have majored in the 'School of Hard Knocks', phrases which today are used to justify both ignorance and aggressive competitive behaviour as learned responses to the problem of survival in a harsh competitive world. L.'s primeval humans are less to be condemned since at this stage they are learning ὑπὸ αὐτῶν τῶν πραγμάτων (*Ep. Hdt.* 75.2), and they are constitutionally unable to apply λογισμός to their situation until 1011 ff.: the idea of co-operation as a pragmatic survival technique has not yet been invented at this point in prehistory. They *have* learned that competition is the only way to survive, because they are not yet capable of making the conceptual leap to the *commune bonum*. They are quite wrong, and this is the very behaviour that would have led to the destruction of the human race (see below on 1026–7).

Lines 962–965: sex

After food and drink, two natural and necessary desires, comes sex; in Epicurean ethics natural but unnecessary (*Ep. Men.* 127–32, *Vat.* 51, see L&S i. 121–5), but in prehistory necessary and inevitable for the propagation of the species (cf. on 848, and 856 above). This provides the only contact the first humans have with each other. From the picture of the beginnings of marriage given at 1011 ff., we may assume that these woodland couplings are promiscuous and do not constitute any sort of marriage or long-term relationship, and that these are chance encounters between the solitary wanderers. Here, there is more emphasis on prehistoric violence than in the previous lines (Mitsis, 1988, 83 n. 55) and sex is presented as the result of either mutual lust, rape, or prostitution, and thus, in its outlines, the image is negative. Further, an implied (negative) analogy is drawn between early-human behaviour and the behaviour of animals mating in the open (as in Hdt. 1.203 and 3.101). However, this tone is softened considerably by the details of the woodland setting, and the payment of acorns, arbute berries, and pears that give the passage a certain pastoral charm (Gale, 1994, 171 notes the frequency of love gifts of flowers and fruit as a topos in pastoral poetry), and alfresco sex is often a positive aspect of both the Golden Age and pastoral landscapes (cf. Tibull. 2.3.69; Longus *Daphnis and Chloe* 3.13 ff.) L. has been so successful in undercutting the negativity of the scene that Beye (1963, 166) sees a picture of an ideal of Epicurean sexual relations here (rightly rejected by Furley, 1978, 15), but, on the other hand, Schiesaro (1990, 129) points out that the analogy between human sex and animal mating in the woods does have some positive force, given the Epicureans' negative attitude to the passion of love:

> l'uomo primitivo, come gli animali, viveva spontaneamente la sua dimensione erotica che 'oggi' è fortemente inibita dal ruolo innaturalmente acquisito della passione amorosa.

(cf. *DRN* 4.1058 ff. with Brown ad loc.).

Giancotti (1989, 172–3) notes that this transaction is carried out by gesture in silence: 'uno pomo porto su una rude mano a una femmina affamata, non una parola articolata'. Except for the cries of terror and pain in 992 and 996, the whole passage from

925–1010 is free of human speech (cf. *taciti* 975). The first hesitant words are uttered at 1022 'vocibus et gestu cum balbe significarent' (see on 1028 ff. below).

962–3. et Venus in silvis iungebat corpora amantum; | conciliabat: the language here is reminiscent of the original creation of the world by a random coming together of atoms (5.416 ff.), which is described in sexual terms (Beye, 1963, 166). Cf. 5.425 ff.:

> omnimodisque coire atque omnia pertemptare
> quaecumque inter se possent congressa creare,
> propterea fit uti magnum vulgata per aevum
> omne genus *coetus* et motus experiundo
> tandem *conveniant* ea quae convecta repente
> magnarum rerum fiunt exordia saepe,
> terrai maris et caeli generisque *animantum.*

and 5.465:

> omnia quae sursum cum *conciliantur* in alto

The analogy between the combining of the atoms and the coupling of primeval humans is in tune with the traditional analogy between cosmogony and human sex, especially in the *hieros gamos* of earth and sky (see above on 799–800; Furley, 1989, 229 ff.). This is strengthened by the description of the atoms that create the world as *vulgata* in 5.427 (cf. *vulgivago* 932). *Concilio* is very often used of marriage and sex (*TLL* 4.41.8 ff.), but usually in L. of atomic combination, cf. 1.611, 1.1043, 2.551, etc., and of atomic combination in zoogony 2.901, 2.919. The metaphor of Venus as a cohesive force bringing together the bodies of the first humans inevitably recalls the function of Empedocles' *Ἀφροδίτη* in combining the elements and limbs of the first animal life, cf. DK31 B71: *συναρμοσθέντ' Ἀφροδίτηι*, 'fitted together by Aphrodite', DK31 B20.5–6: *Φιλότητι συνερχόμεν' εἰς ἓν ἅπαντα | γυῖα*, 'under Love all the limbs come together into one' (cf. also DK31 B21 and fr. a(i) 6–7 M&P). In *DRN* 1.4 ff., Venus is the creative force of the Universe, but L. describes *natura* as fulfilling both her Empedoclean creative and destructive functions in 1.56–7:

> unde omnis *natura* creet res auctet alatque
> quove *eadem* rursum *natura* perempta resolvat

(See Catto, 1988–9, Asmis, 1982; Fowler, 1996*a* = Fowler 2002, 444–52.)

The link with Empedocles' zoogony is underlined by the seeming pun on *animantum* in 'corpora *amantum*', cf. 'compactaque membra animantum' 919, and see on the polemic against Empedocles in 878 ff.

963. vel mutua quamque cupido: mutual desire is given as a crucial characteristic in reproduction at 4.1192 ff. where L. draws an analogy between humans and animals. Here, therefore, female desire need not be seen as another negative analogy with wild beasts, with early women pictured as more lustful, although this is implied for early men by *impensa libido* (see below). In 849–54, this characteristic arose by chance as one of the things that allowed certain creatures to be able to found species (see above), and it is used by the Stoic Balbus as one of the proofs of the care of Providence for the world (Cic. *ND* 2.128).

964. vel violenta viri vis atque impensa libido: apart from the link in the previous line between Venus and the creative force of the Universe, she appears here in very much the same guise as in 4.1058 ff., where she is simply sex or lust (see Brown, 1987, ad loc.). L. separates sex from love ('haec Venus est nobis; hinc autem est nomen Amoris' 4.1058), and treats the latter as a sort of mania, harmful to peace of mind, and to be avoided at all costs. Sex itself is treated in Epicureanism as potentially physically and psychologically harmful (*Vat.* 51), but may be indulged in if it helps to avoid a romantic fixation upon one person (4.1069 ff.; see Fitzgerald, 1984; Kleve, 1969), and indeed L.'s early humans are pictured behaving very much as he advises in his cure for love (cf. 'vulgivagaque vagus venere' 4.1071): having sex promiscuously at random in an emotionally clinical manner, without the passion of love (Schiesaro, 1990, 129). At 4.1079 ff., L. describes the physical violence of the passion of lovers, bruising and biting each other's lips, in his condemnation of love as a mania. Here the primitive men are urged to violence by lust itself, without the need for the urgings of love. In this way their emotional response is more primitive, and the seeming Epicurean approval of passionless sex is undercut: there is passion involved here but it is the violence of lust rather than the milder madness of love. Accordingly, Venus here is as dangerous as Amor will be to civilized humans, but in a different, more direct way.

The male violence associated with primeval sex here is emphasized by the alliteration of the 'v' sounds in *vel violenta viri vis*, and the juxtaposition of *vir* and *vis* echoes the traditional onomatopoeic etymological association of the two (Maltby, 635), cf. 993. Venus has quite the opposite effect here to that of 1017–18 where she is shown softening the natures of the primeval humans and allowing them to co-exist peacefully, and her effects are closer to those in Verg. *G.* 3.209 ff., where she causes tame animals to become wild, and wild animals to become even more savage, in an anti-Lucretian polemic on the causes of civilization and barbarism (see Miles, 1975; Watson, 1984). At 1017 ff., the softening caused by Venus allows the early humans to make the conceptual leap from seeing selfish behaviour as the only survival strategy, to the idea of the effectiveness of mutual altruism and the rightness of pitying the weak, including women and children ('pueros . . . muliebreque saeclum' 1021). Here she leads to violence against women.

The primeval humans were shown in 937 ff. as having simple, praiseworthy, moderate desires for food in the approved Epicurean manner, but here the men, at least, have immoderate uncontrolled lusts (*impensa libido*). As the strength and size of the first humans is greater than today, so their lusts are greater, and like wild beasts, they have less control over them.

965. For the acorns and arbute berries see above on 939 ff. Gale (1994, 171) notes the frequency of love gifts of flowers and fruit as a topos in pastoral poetry, and this pastoral motif tends to undercut the negative tone of this passage on rape and prostitution. Blickman notes that it forms part of L.'s implicit moralizing (1989, 166), comparing the past to the disadvantage of the present. Gale (1994, 171) sees 'a contrast between the innocence of the Golden Age when women were satisfied with such simple offerings, and the decadence of modern society, whose *puellae* ruin their suitors with demands for extravagant luxuries', and notes this as an elegiac topos, cf. Theoc. *Id.* 3.10 f., 11.10; Verg. *Ecl.* 3.64 ff.; Tibull. 2.3.35 f.; Prop. 3.13; Ov. *Ars Am.* 2.261 ff.; cf. *DRN* 4.1121 ff. This line anticipates the explicit moralizing comparisons with present-day moral degradation at 988 ff., and echoes the moderation of the needs of primitive humans for food and drink at 937 ff. Costa (ad loc.) sees a mild satire on the 'convention of pastoral wooing'. The hard foods, *glandes* and *arbuta*, return from 939–41, with pears now added, which give a softer feel. Cf. Diod. Sic. 1.8.1.6: *τοὺς αὐτομάτους ἀπὸ τῶν δένδρων καρπούς*, 'the spontaneous fruits from the trees'; Ov. *Met.* 15.97: '*fetibus arboreis* et quas humus educat herbis'; Sen. *Phaedra* 515: 'excussa silvis *poma*'.

There is clearly something of a contractual relationship here, which anticipates the formation of the first societies and the formation of friendship pacts at 1011 ff. (Perelli, 1967, 163). Here we may imagine a temporary non-aggression pact based on lust and hunger, rather than the less severely utilitarian picture of pacts based on friendship at 1011 ff. Perhaps as well, we may imagine that rather than preventing them attacking one another, lust and hunger are the only reasons L.'s primeval humans take any notice of each other, cf. Ov. *Ars Am.* 2.476: 'iamque diu nulli cognitus alter erat'.

Lines 966–969

Strife between primitive humans and animals is one of the classic topoi of one tradition of prehistory, cf. Pl. *Prt.* 320c ff.; Dicearchus fr. 49 Wehrli; Hermarchus fr. 34 LA; Cic. *Rep.* 1.25.40; Diod. Sic. 1.8.2; Sen. *Ep.* 90; Prudent. *C. Symm.* 2.277 ff.; Rousseau *2nd Discourse* pt. 1. We are clearly not here in any sort of a Golden Age, or blessed state of nature, in which humans and animals live in harmony such as we find in Empedocles DK31 B130; Isaiah 11: 6; Ov. *Met.* 15.96 ff.; Verg. *Ecl.* 4.21 ff.; *Oracula Sibyllina* 3.791–3; Babrius *Fab. Aesop.* preamb. 1–13; Lactant. *Div. Inst.* 7.24; or Pope *Essay on Man* 3.147 ff.

The idea of original harmony between humans and animals seems to be based on an idea of the brotherhood of the two groups, arising from their similarity (cf. Babrius *Fab. Aesop.* preamb. 6–8 where, in the Golden Age, animals could talk and held meetings in the woods). Kenney (1972, 14) notes that, in L., the strife with wild beasts arises from this same similarity between the two. The conflict arises because 'they were in competition with the beasts; they hunted them and were hunted by them'. Thus the anthropomorphic analogy between humans and animals, in which animals behave like humans, is inverted and humans behave like animals. Dicearchus (fr. 49 Wehrli), in a rationalization of the Hesiodic Golden Age, describes an original harmonious relationship between animals and humans, that ends when humans take up a pastoral life and domesticate some animals and attack others (see Boys-Stones, 2001, 14–17). This begins the process of agriculture and of warfare simultaneously, since agriculture leads to property and a desire for more, and so to conflict. He also draws a parallel between violence against animals and violence against humans:

> *συνεισῆλθεν δὲ ὕστερον καὶ πόλεμος καὶ εἰς ἀλλήλους πλεονεξία ἅμα τῇ τῶν ζῴων ἀδικίᾳ*
>
> Warfare and arrogance against others arose at the same time as injustice against animals.

Hesiod does not say that the Golden Race live in harmony with wild animals, but they do live in perfect peace and health (*Op.* 112 ff.), and they are pastoralists (*Op.* 120, but see West ad loc. on the doubtful authenticity of this line). Hesiod gives no reason for the ending of the Golden Race, but Aratus *Phaen.* 96 ff. describes a moral decline through the successive races until finally *Δίκη* leaves the earth when the Bronze Race eat her oxen, suggesting that part of the moral excellence of the former races was their vegetarianism. This idea is also found in Empedocles DK31 B128 (in Porph. *De Abst.* 2.20). Porphyry quotes Empedocles' lines in support of his view that the slaughter of animals led directly to humans killing one another (see Wright, 1995, 282–3), and in Ov. *Met.* 15.75 ff., Ovid's Pythagoras is made to attribute the beginnings of warfare to the departure from former vegetarianism. Pythagoras does accept, however, that some dangerous animals may be killed, so long as they are not eaten (*Met.* 15.106 ff.).

The Epicurean view of the relationship between primitive humans and animals is given by Hermarchus fr. 34 LA (in Porph. *De Abst.* 1.101 ff. = L&S 22N) who, Porphyry reports, attributed the first human societies to the need of people to band together to defend themselves against the attacks of wild animals (Spoerri, 1959, 146; cf. Pl. *Prt.* 320c ff.; Diod. Sic. 1.8.2; Pl. *Rep.* 1.338c; Varro *LL* 8.96 f. See further on 1011 ff.). He justifies the killing of wild animals on the grounds that it is not possible to enter into friendship pacts with creatures that lack reason, and so justice does not extend to animals, and we may kill them if our security demands it (see Vander Waerdt, 1988). Epicurus *ΚΔ* 32 does not limit the extension of justice to creatures that lack reason, but speaks only of the ability to make contracts:

> *Ὅσα τῶν ζῴων μὴ ἐδύνατο συνθήκας ποιεῖσθαι τὰς ὑπὲρ τοῦ μὴ βλάπτειν ἄλληλα μηδὲ βλάπτεσθαι, πρὸς ταῦτα οὐθὲν ἦν δίκαιον οὐδὲ ἄδικον· ὡσαύτως δὲ καὶ τῶν ἐθνῶν ὅσα μὴ ἐδύνατο ἢ μὴ ἐβούλετο τὰς συνθήκας ποιεῖσθαι τὰς ὑπὲρ τοῦ μὴ βλάπτειν μηδὲ βλάπτεσθαι.*
>
> Nothing is just or unjust in relation to those creatures which were unable to make contracts over not harming one another and not being harmed; so too with all peoples which were unable or unwilling to make contracts with one another, over not harming and not being harmed. (L&S 22A2)

It seems that this definition would bring domesticated animals within the limits of justice, leaving wild animals outside (L&S i. 135).

Cf. *ΚΔ* 39:

> *Ὁ ⟨τὰ ἑαυτοῦ πρὸς⟩ τὸ μὴ θαρροῦν ἀπὸ τῶν ἔξωθεν ἄριστα συστησάμενος, οὗτος τὰ μὲν δυνατὰ ὁμόφυλα κατεσκευάσατο, τὰ δὲ μὴ δυνατὰ οὐκ ἀλλόφυλά γε· ὅσα δὲ μηδὲ τοῦτο δυνατὸς ἦν, ἀνεπίμεικτος ἐγένετο καὶ ἐξηρείσατο ὅσα ⟨πρὸς⟩ τοῦτ᾽ ἐλυσιτέλει πράττειν.*
>
> He who best knew how to meet fear of external foes made into one family all the creatures he could; and those he could not, he at any rate did not treat as aliens; and where he found even this impossible, he avoided all intercourse, and, so far as was expedient, kept them at a distance. (Trans. Hicks)

This seems to be both a reference to prehistory and a more universal principle (Blickman, 1989, 168; Müller, 1972, 124 ff.) and clearly is much more moderate in its treatment of the relationship between humans and animals than is Hermarchus, and suggests that the Epicurean will attempt to treat humans and animals in the same way, and make friendship pacts with them. But, here in L., we are shown the stage before that described by Epicurus, when even humans were not able to make pacts with one another, and so no peaceful co-existence between humans and animals was possible.

966. et manuum . . . pedumque: a Hesiodic touch, cf. *Op.* 114–15:

> *αἰεὶ δὲ πόδας καὶ χεῖρας ὁμοῖοι*
> *τέρποντ᾽ ἐν θαλίῃσι, κακῶν ἔκτοσθεν ἁπάντων·*

With hands and feet ever unchanged they enjoyed themselves in feasting, beyond all ills.

(Asmis, 1996). Hesiod's Golden Race are also free from disease (cf. 930) and have unwearied feet and hands (West on *Op.* 113–15 compares *Od.* 11.497 and 19.359). They do not strictly need strength since they live a life of ease. L. has appropriated the Hesiodic motif and uses it in another Dicearchan rationalization of Golden Age ideas. His first humans do need strength and toughness if they are to survive at all, and here another reason is added for their ability to survive: they are remarkably strong and fleet-footed, and so can both defend themselves against wild animals and chase and kill them for food. They must rely (*freti*) upon their great strength since they have little or no technology to aid them in their hunting (see below on 968, cf. De Léry *Histoire* ch. 5 on the Margaia of Brazil).

This seems to be part of the reason for the greater strength of Neanderthals: they, lacking technologies such as the spear-thrower, needed to be significantly more powerful than their contemporaries *Homo sapiens sapiens* who had greater technological ability. Similarly, modern humans have lost strength, stature, and robustness since the beginnings of agriculture, and the less physically demanding life that entails (for the various arguments see Lewin, 1998*b*, 60 ff.).

967. Hunting adds a third part of the prehistoric economy to the gathering of nuts in 939–42, and the scavenging behaviour in 961–2 (for hunting see Pl. *Leg.* 3.676 ff.; Dicearchus fr. 49 Wehrli). This takes place in the woods, as we should expect since L., as is traditional, uses the woodland theme as emblematic for this earliest period. From the number of references to woods in descriptions of prehistoric life, it would seem that there was a generally accepted idea in antiquity that early people had inhabited woodland. This is especially apparent in Roman writers (cf. Cic. *Rep.* 1.25.40; Vitruv. *De Arch.* 2.1; Ov. *Ars. Am.*

2.467 ff. and *Fasti* 2.289 ff. with Frazer ad loc.; Sen. *Phaedra* 538–9; Juv. *Sat.* 6.1 ff.). Greek writers more often mention mountains or fields, cf. *Od.* 9.106 ff.; *Hom. Hymn Heph.* 3–4; Moschion *TrGF* 1.97 fr. 6.42. Perhaps this reflects the more heavily wooded Italian landscape. L. twice mentions the clearance of woodland for prehistoric agriculture (1247–8 and 1370–1), and this suggests he was aware that large-scale deforestation had occurred since prehistoric times. The description of prehistoric hunting by driving animals from woodland with fire at 1249–50 should perhaps be regarded, despite the woodland theme, as taking place in a temporally indeterminate period (cf. Blickman, 1989, 165. Cf. 953 and 1011).

968. Line 975 in O and Q, and moved here by Naugerius. Marullus puts it after 961, which gives a far more violent picture of human relations, cf. 5.1283–4:

> arma antiqua manus ungues dentesque fuerunt
> et *lapides* et item *silvarum fragmina rami*

However, the matter of the passage here is still of violent conflict between humans and animals rather than between humans, and so it does sit more comfortably here after 967 on hunting. Piero di Cosimo in *The Hunt* (*c.*1505), for whom Marullus' text (1511–12) was presumably not available at the time of painting, portrays extreme human/animal violence in L.'s prehistoric world, but no explicit violence between humans (cf. further the peaceful co-operative tone of *The Return from the Hunt*. See Whistler and Bomford, 1999).

Technology is not entirely lacking from the lives of the first humans. However, the weapons are the simplest possible found objects, and the clubs are simply heavy sticks broken off trees rather than manufactured weapons, as in 1283–4. Compare the clubs made from broken branches in Piero di Cosimo's *The Hunt*.

Horace, echoing *DRN* 5.1283–4, defines *arma* as later manufactured weapons, and contrasts them with *fustes*, *Sat.* 1.3.101–2:

> *unguibus* et *pugnis*, dein *fustibus*, atque ita porro
> pugnabant *armis* quae post fabricaverat usus.

Accordingly no real application of λογισμός is necessary to explain the use of these naturally occurring weapons, and so Epicurus' two-stage process of learning, in which people first learned ὑπὸ αὐτῶν τῶν πραγμάτων and then applied λογισμός to their discoveries, is preserved (*Ep. Hdt.* 75.1–6. See Manuwald, 1980, with Fowler's review, 1982). Both Horace and L. describe human conflict with the same weapons used here for hunting, cf. Dicearchus' direct attribution of the beginnings of warfare to the beginnings of hunting in fr. 49 Wehrli. (See above, introduction to 966–9.) Clubs are also found as the weapons of war of other early peoples, including the Rutulians in *Aeneid* 7.505 ff., cf. Hyginus 274.22: 'Afri et Aegyptii primum fustibus dimicaverunt'; Pliny *NH* 7.200: 'proelium Afri contra Aegyptos primum fecere fustibus' (see Cole, 1990, 50 n. 7).

969. multaque vincebant, vitabant pauca latebris: the hunters are probably the subject of both *vincebant* and *vitabant* (Costa ad loc.). The chiastic order would seem to confirm this. However, the confusion over who is hunting whom, and the description of human hiding places as *latebrae*, interchangeable for human and animal lairs (*OLD* s.v. 1 and 1b, *TLL* 7.992.36 ff.), underlines the closeness of these hunters in behaviour to their prey, cf. *DRN* 6.766: *de latebris serpentia saecla ferarum*, Verg. *G.* 3.544, and 4.42.

Lines 970–972

Pares in line 970 suggests both that the primitive humans are bristly like boars, and that they are their equals: their hairiness underlined by the ironic *nuda*. Humans are in fact animals, as we should expect from many other rational sources (see Appendix A). They have not yet been differentiated from the other animals by their greater possession of intelligence, as Archelaus (DK60 A4) would have it, or by the acquisition of intelligence arising from their possession of manual dexterity (cf. Democritus DK68 B144). Their humanity is still only potential at this stage, they compete on equal terms with all but the fiercest wild animals (cf. 985 below), and are barely distinguishable from them physically and behaviourally (cf. Verg. *G.* 3.230: *instrato saxa cubili* of the beds of bulls (Gale, 2000, 96 n. 124)). In this, they are Satyr, Minotaur, or Centaur-like, all except for their lack of a compound physiology (see above on 878 ff.). Boars are a good analogy since they have also become less hairy under domestication. Presumably, hairiness would aid in protecting boars and primitive humans from the elements. Diogenes the Cynic is reported to have considered that modern humans can survive naked, and that they do not need any fur or feathers, since otherwise the first humans would not have survived (Dio Chrys. *Orat.* 6.26). This strongly suggests that Diogenes considered early humans no hairier than modern ones. Here L. has nature providing the same protection for primitive humans as for animals. The theme of the *greater* care of nature for animals than humans, providing them with better protection against the elements, is found from Xenophon onwards (*Mem.* 1.4.2, L&B 389 ff.), and is used by L. himself in the argument against the world having been designed for the benefit of humans at 5.195 ff., cf. 5.231: 'nec varias quaerunt [animals] vestis pro tempore caeli'. It is sometimes expressed in the phrase 'natura non mater, sed noverca' (cf. Cic. *Rep.* 3.1.1; Philo *De Post. Caini* 162). Cf. Pliny *NH* 7.2:

> . . . *ut non sit satis aestimare, parens melior homini an tristior noverca fuerit.* ante omnia unum animantium cunctorum alienis velat opibus, *ceteris varie tegimenta tribuit,* testas, cortices, spinas, coria, villos, saetas, pilos, plumam, pinnas, squamas, vellera. truncos etiam arboresque cortice, interdum gemino, a frigoribus et calore tutata est. *hominem tantum nudum et in nuda humo natali die abicit* ad vagitus statim et ploratum.

In Plato's *Protagoras* (320c ff.), the necessity for human acquisition of culture arises from their original nakedness.

972. **foliis ac frondibus:** the classic bedding and shelter of primitive humans, especially after L. (cf. 987 *instrata cubilia fronde*), cf. Cicero's Lucretian paraphrase, *Rep.* 1.25.40: 'frondes et herbas pro cubilibus'; Vitruv. *De Arch.* 2.1: 'in silvis et speluncis et nemoribus nascebantur'; Ov. *Ars Am.* 2.475: 'silva domus fuerat cibus herba cubilia frondes'; Grat. Fal. *Cyn.* 3: 'nuda silvas virtute movebant'; Sen. *Ep.* 90.7 (Posidonius fr. 284 E–K): 'sparsos et aut cavis tectos aut aliqua rupe suffosa aut exesae arboris trunco'.

Lines 973–981: waiting for the sun

Here, L. is arguing against an idea that primitive humans were afraid that the sun would not return, cf. Wakefield ad loc.: 'Quorundam philosophorum opiniones hic videtur ire oppugnatum noster.' The negative *nec* cannot here be replaced by *necdum*, and so this should be a polemic (Schrijvers, 1999, 86, see above on 953). It is difficult to identify the origins of the idea L. is arguing against, since it is found explicitly only later, cf. Manilius *Astron.* 1.66–70:

> nam rudis ante illos nullo discrimine vita
> in speciem conversa operum ratione carebat
> et stupefacta novo pendebat lumine mundi,
> tum velut amissis maerens, tum laeta renatis
> sideribus, variosque dies incertaque noctis
> tempora nec similis umbras, iam sole regresso
> iam propiore, suis discernere nescia causis.

The similarity of the two passages suggests strongly that Manilius is arguing against L. (Perelli, 1967, 162). However, this fear of the loss of the sun is attributed to the ancient Arcadians in Stat. *Theb.* 4.275–84 (Schrijvers, 1999, 96):

> Arcades huic veteres astris lunaque priores . . .
> . . . hi lucis stupuisse vices noctisque feruntur
> nubila et occiduum longe Titana secuti
> desperasse diem . . .

Statius links this to the idea that Arcadians were so ancient they existed before the moon. This latter idea is early (e.g. Pind. fr. 74b Schroeder; Hippys of Rhegium FGrH 554 F 7; Arist. fr. 591 Rose; Ap. Rhod. 4.264–5; Scholion on Aristoph. *Nub.* 397; cf. Ov. *Fasti* 2.289 ff.; and see Schrijvers, 1999, 95–6 n. 26). Schrijvers considers that this linking of the Arcadians pre-existing the moon and their panic at the sun's setting because they have no moonlight is also traditional, and that L. is arguing against a whole tradition of mythological prehistory, in which the Arcadians are the earliest people, born, like L.'s first humans, autochthonously, living an *erramento ferino*, but afflicted by panic each evening. Accordingly, by arguing against the panic, L. replaces the entire Arcadian tradition of prehistory with his own. In particular, he substitutes the more natural-seeming biological explanation of the origin of humans from wombs rooted in the earth, for the Arcadian tree-origins theory, and implicitly refutes the cosmological theory of the separate creation of sun and moon (Schrijvers, 1999, 95–6). It would seem more natural that primitive people should panic at the loss of the sun if, like the Arcadians, they had no moon to replace it at night, and this makes Statius' linking of the two ideas more likely to be traditional. L. does not, however, explicitly use cosmological arguments to refute the night panic theory, but relies on psychology (Schrijvers, 1999, 96). Lines 973–6 are a straightforward statement that people did not fear the non-return of the sun, and 977–81 provide the psychological explanation.

973–6. This theme of night and darkness provides a balancing section to the former description of daytime wandering activities introduced with the analogy of the orbit of the sun. Now in the harsher part of the prehistory begun at 953, the theme of darkness and its terrors is appropriate.

973–4. nec . . . diem . . . solemque . . . | quaerebant . . . palantes: L. denies that early humans panicked at the loss of the sun, and that they wandered searching for it at night. They wander only during the day. Indeed they, although beast-like, are not nocturnal, and although they are both scavengers and predators, they are, in this respect, less wild and bestial than the other animals they compete with.

973–5. nec plangore . . . magno . . . | . . . pavidi . . . | . . . taciti: L. anticipates the noises and panics of the night-time attacks of wild beasts and the moans of their victims, cf. *paventes* 986; 'nemora ac montis gemitu silvasque replebat' 992; 'tremulas . . . | palmas' 995–6; 'horriferis . . . vocibus' 996. These cries are the only human sounds to break the silence of the passage. There is, as yet, no language bar signs (cf. 962 ff.), and the first words are hesitantly spoken at 1022 'vocibus et gestu cum balbe' (Giancotti, 1989, 172–3). The early humans are silent (*taciti* 975) except when these instinctive cries are forced out of them by pain and shock (cf. 3.495 ff. and see below on 5.1028 ff.).

975. somnoque sepulti: an Ennian borrowing from *Ann.* 292, as at *DRN* 1.133, cf. Verg. *A.* 2.265; Quint. *Decl.* 272.13.2; Homerus Latinus *Ilias* 730.

976. rosea face sol: a Homeric touch, echoing ῥοδοδάκτυλος Ἠώς; cf. 5.610: 'rosea sol alte lampade lucens'; 5.656–7: 'roseam Matuta per oras | aetheris auroram differt'.

977–81. L. now explains why people did not wonder about the sun and did not worry that it might not return. This follows the mode of a Sceptic argument on differences of perception (Schrijvers, 1999, 173: 'mode 9: fondé sur le caractère nouveau ou usuel ou bien sur la rareté de l'objet perçu'. Cf. Sext. Emp. *Pyrrh.* 1.141–3). Schrijvers compares 2.1028–9:

> nil adeo magnum neque tam mirabile quicquam
> quod non paulatim minuant mirarier omnes.

Sextus argues that the sun, seen for the first time, would be much more astonishing than the appearance of a comet, and it is only the comet's rarity that makes it more an object of wonder. L.'s argument would seem to be that the disappearance of the sun could not cause wonder since the two phenomena, the sun's disappearance and reappearance, were so familiar as to be connected in the minds of primitive humans. Thus, the reappearance of the sun need not be predicted by an application of reason, which in any case is lacking from the lives of early humans, but would be something learned directly from nature itself. This agrees with Furley's (1978, 16 ff.) and Blickman's (1989, 176–7) reading that here L. argues against the existence of false opinions about the heavenly bodies in ancient times, and that these arose only later along with false opinions about the gods derived from misguided attempts to explain the orderly revolutions of the sun, moon, and stars (5.1183 ff.). There L. makes it clear that it was the misapplication of reason that led to the attribution of cosmic control to the gods. The first humans had no false beliefs about the gods, and so no false beliefs about the heavens (cf. Phld. *De Piet.* 225 ff. with Obbink ad loc., and Obbink, 1995, 197 ff.). Here the early humans are simply unable to wonder at the sun because of its familiarity, and so do not pay it any mind. Thus, equally, they are unable to form false opinions about it. The basis of Manilius' argument against L. in *Astronomica* 1.66 ff. is that early humans led a miserable life *because* they lacked an understanding of the heavens, and that astronomy led to religion, which rescued humanity from a state of bestial fear. L. derives fear of the gods from the misplaced attribution of temporal powers to them, and this fear is closely associated with the other fear that infects human life, that of death (cf. Epicurus *KΔ* 10; Diog. Oin. fr. 28 Smith), which can be seen in 3.59 ff. causing the ills that beset civilization (greed, blind craving for political position, the amassing of wealth, civil war, murder, envy, suicide, etc.). This list of the evils caused by the fear of death is again firmly set in the context of the rise of civilization at 5.1120 ff. where L. explains that the origins of legislation lay in the need to repress civil conflict caused by a vain attempt to gain security by struggling for wealth and position (Blickman, 1989, 173–8). Here in prehistory there is fear and conflict, but these arise not from mistaken ideas of religion but from competition with wild beasts. Cf. Vergil's appropriation of 980–1 for a religious context at *G.* 1.468 (Gale, 2000, 36 n. 55).

Lines 982–987: terrors of the night

The early humans did live in fear, and feared death, but quite reasonably they feared being killed by wild animals rather than irrationally fearing the heavens. Schrijvers (1999, 96) notes the traditional character of this appeal to necessity in prehistory: actions necessary for survival were chronologically prior to unnecessary actions (Pöhlmann, 1991, 217–28; cf. Democritus DK68 B144 on music as a late development for the same reason), and suggests that the primitive humans simply did not have time to worry about the sun (cf. Blickman, 1989, 176).

982. **sed magis illud erat curae:** while it is true that their time and energies were taken up by the pragmatics of survival, the contrast seems to be between the different fears of modern and prehistoric peoples (cf. *pavidi* 974; *paventes* 986). They did not have irrational fears about the heavens (and thus no religious fears), but, perfectly rationally, feared the attacks of wild beasts.

saecla ferarum: see above on 947.

the ending of the Golden Age, and the decline from a previously blessed state, and this ambivalence is played on by Hes. *Op.* 182–3 (see West ad loc.):

> *οὐδὲ πατὴρ παίδεσσιν ὁμοίιος οὐδέ τι παῖδες*
> *οὐδὲ ξεῖνος ξεινοδόκῳ καὶ ἑταῖρος ἑταίρῳ,*

Nor will father be like children, nor children to father, nor guest to host nor comrade to comrade . . .

Compare Ovid's version, *Met.* 1.44: 'vivitur ex rapto: non *hospes* ab *hospite* tutus'.

Lines 988–1010

Now the description of the wild wandering stage is essentially complete (although L. will return to it later), and this section is dominated by moralizing comparisons to the disadvantage of modern ethics. It need not be thought that this implies L. places any positive moral value judgement on the way of life of this stage of prehistory: the people of the wild wandering stage are set up simply as foils for comparison with today, and just as appeals to the lives of noble savages such as the Ethiopians tell us little about the real people of Ethiopia, we learn little about the real people of the past. Apart from granting prehistoric people a greater simplicity and guilessness, L.'s technique in this section is to paint as grim a picture of the past as reasonably possible, the better to criticize modern *mores*. It is much more effective to say 'things were dreadful *then*, but, Lord, *now* . . . !' than 'it was so lovely then, what a pity now . . .' (compare Seneca's moralizing in *Ep.* 90, and De Léry's use of the cannibalism of the Tupinamba as a weapon against Catholic *mores*). Again, the past is simply a backdrop against which we view the present, and the scenery may be changed at will. Each of the themes L. uses has already had a long career in prehistoric speculations (see Appendix B), and the technique itself a very respectable philosophical pedigree from the highly regarded Peripatetic Dicearchus (fr. 24 Wehrli; see below on 988–9; Boys-Stones, 2001, 14–17).

There are four main sections:

1. 988–1000: lack of warfare, including lack of medicine, and overlapping with—

2. 1000–1006: lack of seafaring
3. 1007–1008: ancient starvation, closely allied to—
4. 1009–1010: ancient accidental poisoning through lack of botanical knowledge.

Compare especially:

Lack of warfare: Hes. *Op.* 109 ff.; Pind. *P.* 10.29 ff.; Empedocles DK31 B128 and B130; Pl. *Plt.* 271 ff., and *Leg.* 3.679a ff.; Dicearchus fr. 49 Wehrli; Aratus *Phaen.* 96 ff.; Posidonius fr. 284 E–K (Sen. *Ep.* 90).

Lack of seafaring: Od. 9.106 ff., perhaps Hes. *Op.* 109 ff.; Aratus *Phaen.* 96 ff.; Agatharchides *De Mari Erythraeo* 49.

Prehistoric starvation: Hippoc. *De Vet. Med.* 3.26; Pl. *Rep.* 369c; Aristoph. *Plut.* 468 ff., 510 ff., and 532 ff.; Dicearchus fr. 49 Wehrli; Eratosthenes *Merc.* fr. 10.11 Hiller; [Theoc.] *Piscat.* 1 ff.; Diod. Sic. 1.8.6–7.

Lack of medicine: Aesch. *PV* 478 ff.; Hippoc. *De Vet. Med.* 3.26.

Prehistoric death and the lack of warfare

L. begins with the similarity of mortality rates of modern and prehistoric peoples, but delays the reason for it (999–1001) until after an ecphrasis of the horrors of prehistoric deaths caused by wild animals, in order to point the contrast with the present.

Although the lack of warfare in prehistory or the Golden Age is a standard topos, as we should expect, L. gives it an Epicurean twist. Generally, there are two basic approaches that can be identified:

1. Peace and harmony in primitive times, later dissolving into strife and warfare due to a fall from moral grace caused by (or characterized by) the invention of property and the amassing of wealth, which leads to greed for more and thus conflict.
2. The bestial nature of early humans inevitably causes conflict between them, and this is prevented only by the imposition of legislation, or by the direct intervention of kings or outstanding individuals.

L.'s position falls somewhere between these two extremes. There is not much in the way of peace in his prehistory, and, while conflict is mainly between humans and wild beasts, there is some violence between humans, and no co-operation. On the other hand, the original bestial human nature does not lead to large-scale warfare or slaughter, and the beginnings of peaceful societal harmony are not introduced by force from without, but arise naturally by consent between the first villagers (see on 1011–27 below). This unusual approach can be explained with reference to the Epicurean view of the origins of strife, conflict, and warfare, which L. gives in 3.59–93 and 5.1105–60, and which is reinforced by Philodemus' outline of the origins of impiety in *De Pietate* (see Introduction; Obbink, 1995, 189ff.). In 3.59ff. the origins of civil war, murder, the amassing of wealth, fratricide, and warfare for the sake of personal glory are closely linked to the fear of death. In 5.1105ff., the origins of civilization itself are described in similar terms, with the rise of cities and kings attributed to the need for their own personal protection, and the invention of property and wealth leading to a vain attempt to achieve a stable secure life through its acquisition and the acquisition of political power, which leads to competition and conflict, and thus to revolution, bloodshed, and anarchy (see Introduction; Blickman, 1989, 173ff.). Warfare itself is a phenomenon of the civilized stage.

The Epicurean view of the role of property and wealth in the moral decline of the human race is very close to the traditional moralizing position and can be found in almost any moralist (see Appendix B s.v. 'Linked themes'). But the distinctive feature of the Epicurean approach is to attribute the psychological disturbance that leads to the desire to amass riches to the fear of death. This inevitably makes the Epicurean view of the behaviour of early humans more complex than the traditional view, in which the moral decline that leads to greed for wealth, and thus to conflict and warfare, is caused directly by the invention of property and wealth, and thus human nature is irremediably degraded, and societal harmony is brought about only by the repression of the results of moral degradation, and the treatment of its symptoms. The Epicurean view is more optimistic in that the disease itself is curable: the freeing of the human mind from fear removes the causes of the behaviour that leads to conflict and warfare.

L.'s picture is divided into three parts rather than two: conflict and competition in the 'natural' phase, later being replaced by societal harmony based on a system of mutual altruism, then dissolving into violence and warfare with the beginnings of civilization. Hence, his contrast between the appalling horrors of prehistoric death in the jaws of wild beasts and the slaughter of thousands in modern warfare becomes part of Epicurean ethical teaching, rather than simply a homily on human moral decline such as we get in other accounts. Moral decline is not necessary to account for the phenomenon of warfare, or the other societal evils listed in 3.59ff. and 5.1120ff. These arise from false opinion about the world and the gods, and this is precisely the Epicurean ethical purpose: to remove fear by replacing false opinion with Epicurean *vera ratio*.

988–9. This is similar to an argument of Dicearchus on the prehistoric and modern mortality rates, Cic. *De Off.* 2.5 (fr. 24 Wehrli):

> est Dicaearchi liber de interitu hominum, Peripatetici magni et copiosi, qui collectis ceteris causis eluvionis, pestilentiae, vastitatis, beluarum etiam repentinae multitudinis, quarum impetu docet quaedam hominum genera esse consumpta, deinde comparat, quanto plures deleti sint homines hominum impetu, id est bellis aut seditionibus, quam omni reliqua calamitate.

Schrijvers (1999, 93) considers that L.'s argument derives directly from Dicearchus. Sedley (1998, 72 n. 51) prefers, perhaps correctly, to see the indirect influence of Dicearchus through Epicurus, but it could well be that Dicearchus retails a traditional comparison between modern and prehistoric times that he and L., and perhaps Epicurus, follow. The arguments of L. and Dicearchus are somewhat different. L. claims that the prehistoric death rate was slightly higher than the modern, while Dicearchus says that the modern toll is much higher. The difference of emphasis arises from Dicearchus' acceptance that the lives of humans were a sort of Golden Age, but without the mythical trappings (fr. 49 Wehrli). His view in fr. 49 is that humans and animals once lived in harmony, and that conflict between them arose only with the beginnings of pastoralism. The origins of warfare lay in the invention of property, and simultaneously with conflict between humans and animals, arose conflict between humans, driven by greed for more. L., of course, denies that there was either harmony between humans, or harmony between humans and animals. The two arguments may be summarized as (Dicearchus): 'Due to a moral decline caused by property and greed, warfare now kills far more people than unavoidable natural disasters used to, and so our age is morally decadent', and (L.): 'The death rate then and now is much the same because, although people were very often eaten by wild animals, they were, at least, not killed *en masse* in warfare.' Presented in this way it can be seen that L.'s comparison has quite a different emphasis from Dicearchus'.

Compare Cicero's paraphrase of Dicearchus: 'quanto plures *deleti sint* homines'. L.'s phrase for 'violent untimely death' adds considerable pathos, and with *lamentis* anticipates the groans of those trapped in the jaws of wild animals and the terrified cries of those dying from dreadful wounds. There is also a suggestion that people even then, despite their bestial natures and harsh lives, were not inured to the thought of violent death, and that life was as sweet to them as it is to us. The imagery is nearly the reverse of 'into the shores of light' for birth at 781 (see above), and is reminiscent of the deaths of the plague victims in 6.1157–8: 'octavoque fere candenti lumine solis | aut etiam nona reddebant lampade vitam'. There seems to be an ambivalence in the phrase that, as well as 'the number of deaths then was not much greater', suggests 'they did not lament their deaths much more than now'. This recalls Epicurus *KΔ* 40:

> *Ὅσοι τὴν δύναμιν ἔσχον τοῦ τὸ θαρρεῖν μάλιστα ἐκ τῶν ὁμορούντων παρασκευάσασθαι, οὕτω καὶ ἐβίωσαν μετ' ἀλλήλων ἥδιστα τὸ βεβαιότατον πίστωμα ἔχοντες, καὶ πληρεστάτην οἰκειότητα ἀπολαβόντες οὐκ ὠδύραντο ὡς πρὸς ἔλεον τὴν τοῦ τελευτήσαντος προκαταστροφήν.*

> Those who were best able to provide themselves with the means of security against their neighbours, being thus in the possession of the surest guarantee, passed the most agreeable life in each other's society; and their enjoyment of the fullest intimacy was such that, if one of them died before his time, the survivors did not lament his death as if it called for commiseration. (Trans. Godwin)

This is clearly set in the context of the first societies rather than the wandering stage, but there may be some inter-temporal ethical crossover between the two here.

988. mortalia saecla: see on 791 and 805 above.

Lines 990–998: attacks by wild animals

990. unus . . . quisque: 'each one singly'. The contrast is with the *multa . . . milia* in 999 who are killed *en masse* in battle, and anticipates *una dies dabat exitio* of 1000. We are reminded that they wander alone. Hermarchus (fr. 34 LA) attributes the survival of the human race to their decision to band together to defend themselves against animal attack; a different emphasis from L. (see below on 1011–27), Porph. *De Abst.* 1.10.4–6:

> *οὐ γὰρ δυνατὸν ἦν σῴζεσθαι μὴ πειρωμένους ἀμύνεσθαι αὐτὰ συντρεφομένους μετ' ἀλλήλων.*
>
> man would not have been able to survive without taking steps to defend himself against animals by living a social life. (Trans. L&S)

This is also the view attributed (implicitly) to the Epicureans, and contrasted with Stoic *οἰκείωσις* by Cicero, *Rep.* 1.25.40 (Lactantius *Div. Inst.* 6.10.13):

> . . . bestiis et fortioribus animalibus praedae fuisse commemorant. tum eos qui aut laniati effugerant, aut laniari proximos viderant, admonitos periculi sui ad alios homines decucurrisse, praesidium implorasse . . .

Plato puts a similar view in the mouth of Protagoras, *Protagoras* 322a–b:

> *οὕτω δὴ παρεσκευασμένοι κατ' ἀρχὰς ἄνθρωποι ᾤκουν σποράδην, πόλεις δὲ οὐκ ἦσαν· ἀπώλλυντο οὖν ὑπὸ τῶν θηρίων διὰ τὸ πανταχῇ αὐτῶν ἀσθενέστεροι εἶναι, καὶ ἡ δημιουργικὴ τέχνη αὐτοῖς πρὸς μὲν τροφὴν ἱκανὴ βοηθὸς ἦν, πρὸς δὲ τὸν τῶν θηρίων πόλεμον ἐνδεής—πολιτικὴν γὰρ τέχνην οὔπω εἶχον, ἧς μέρος πολεμική—ἐζήτουν δὴ ἀθροίζεσθαι καὶ σῴζεσθαι κτίζοντες πόλεις·*
>
> Mankind at first lived dispersed and there were no cities. But the consequence was that they were destroyed by the wild beasts . . . After a while the desire for self-preservation gathered them into cities . . . (Trans. L&B)

And Diod. Sic. 1.8.2–3:

> *καὶ πολεμουμένους μὲν ὑπὸ τῶν θηρίων ἀλλήλοις βοηθεῖν ὑπὸ τοῦ συμφέροντος διδασκομένους, ἀθροιζομένους δὲ διὰ τὸν φόβον ἐπιγινώσκειν ἐκ τοῦ κατὰ μικρὸν τοὺς ἀλλήλων τύπους.*
>
> When they were attacked by wild beasts they, taught by self-interest, came to one another's aid; and after they had thus been led by fear to

gather into groups, they presently came to understand the signs they made to one another. (Trans. L&B)

991. pabula viva feris praebebat: here again we see the notion of interchangeability between human and animal as in 969 *latebris*, and 986–7 (see above). There the shelters of humans are also the lairs of wild animals, and here the roles of hunter and hunted are reversed. At 869–70, grazing animals are saved from extinction by the granting of *larga . . . pabula* by humans, and the food of the early humans is described as *pabula dura* 944. Now humans become *pabula* for wild beasts even fiercer than themselves.

992. See on 'sed nemora atque cavos montis silvasque colebant' 955, and Appendix B s.v. 'Living in Fields/ Mountains/Forests/ Caves'.

993. viva videns vivo sepeliri viscera busto: the 'vi' sounds are onomatopoeic for the violence of the attack, cf. *vel violenta viri vis* 964, and the traditional onomatopoeic etymology of *vis* (Maltby, 635). Bailey and Costa note the popularity from Aeschylus onwards of this notion of prey being entombed inside its predator, cf. Aesch. *Septem* 1020–1; Soph. *El.* 1487–8, Gorgias DK82 B5a; Enn. *Ann.* 138–9V; Accius 226; Ov. *Met.* 6.665, *Her.* 10.123–4; Spenser *Faerie Queene* 2.8.16; Shakespeare *Macbeth* 3.4.72. L. adds the horrific touch of the victim seeing himself being eaten. There is nothing as terrifying as this in Piero di Cosimo's *The Hunt*, where the one dead human lies uneaten in the woods, and the wild beasts are getting the worse of the fight.

994–8. Some people were eaten by wild beasts, others escaped wounded but died anyway from their wounds because of the lack of medicine. Medicine was of course less necessary then than now, because of their greater resistance to disease, and this helps account for the survival of the first humans (see on 929–30 above). Here, however, the argument has changed, and with the survival of prehistoric people established, the lack of medicine becomes useful to L. in increasing the prehistoric death toll and the pathos of the scene, and thereby providing a more effective contrast with the mass slaughter of modern warfare. The lack of medicine is also allied to the accidental poisonings of 1009: they have little knowledge of plants and so are ignorant of which may be beneficial and which may be poisonous (cf. Hippoc. *De Vet. Med.* 3.26).

We could now hardly be farther away from the disease-free state of Hesiod's Golden Age (cf. *Op.* 112–16). On the other hand, Aesch. *PV* 478 ff. has Prometheus claim:

> τὸ μὲν μέγιστον, εἴ τις ἐς νόσον πέσοι,
> οὐκ ἦν ἀλέξημ' οὐδέν, οὔτε βρώσιμον,
> οὐ χριστόν, οὐδὲ πιστόν, ἀλλὰ φαρμάκων
> χρείᾳ κατεσκέλλοντο, πρίν γ' ἐγώ σφισιν
> ἔδειξα κράσεις ἠπίων ἀκεσμάτων,
> αἷς τὰς ἁπάσας ἐξαμύνονται νόσους.

> This first and foremost: if ever man fell ill, there was no defence—no healing food, no ointment, nor any drink—but for lack of medicine they wasted away, until I showed them how to mix soothing remedies with which they now ward off all their disorders.

Although the early humans have not yet been infected by false opinions about the gods (see above on 973 ff.), they are portrayed as terrified of death. As in 3.832 ff., where the proof of the mortality of the soul is followed by the diatribe against the fear of death in order to banish any fear of death that does not arise from a belief in the punishments awaiting the soul in the afterlife, here we see a fear of death that does not derive from religion. It may be perfectly reasonable, and beneficial, to fear death before the event and thus try to avoid it (see Furley, 1986, 75 ff.), but only Epicureanism can provide the peace of mind that can overcome the fear of the fact of death itself, and overcome the worst physical pain by mental pleasure.

995. ulcera taetra: l.31 reads *ulcera*, OQ *vicerat*, cf. 6.1200 *ulceribus taetris* of the symptoms of the plague, Lambinus' certain emendation for OQ's *viceribus taetris* there, where of course medicine failed to help, 6.1179: *mussabat tacito medicina timore*. For the plague symptom, cf. L.'s source, Thuc. 2.49.6.7: ἑλκώσεως . . . ἰσχυρᾶς.

996. horriferis accibant vocibus Orcum: prehistoric people did not yet attribute great powers to the gods or assign realms of influence to them (5.1183 ff.). For a similar figurative usage cf. 5.1125–6 'deicit ictos | invidia in Tartara taetra', although Tartarus does not exist (cf. 3.25). Although the gods did have their real names in prehistoric times (Phld. *De Piet.* 519–41 with Obbink ad loc.; cf. *Ep. Hdt.* 77), Orcus could hardly be one of them (cf. 3.25 ff.), and so we need not see any hint of ancient superstition here as Gale does (1994, 175). Perhaps we see L. giving an onomatopoeic etymology for the god's name: people named the god of the underworld from the cries of the dying (cf. on 1085–6 'corvorum greges ubi *aquam* dicuntur et imbris | poscere'). In doing so he would escape the criticisms of Epicurus in *Περὶ Φύσεως* 12, who, Philodemus tells us (*De Piet.* 519–41 Obbink), criticized Prodicus, Diagoras, and Critias for giving etymologies for the names of the gods derived from human concerns (for the technique cf. *De Piet.* P. Herc. 1428 col. 9.27–9 (Henrichs, 1974, 21); Cic. *ND* 2.66: 'Neptunus a nando' etc., see Obbink, 1996, 358 ff.). The names of non-existent gods may reasonably be explained by such an etymology.

vocibus: *voces* may be used for animal or human sounds (cf. 1059–60, 1066, 1087–8 below). The first humans would be able to produce words, if only crudely formed ones, in direct response to external stimuli. *Communication* using spoken language, however, is a separate ability, and does not arise properly until the beginnings of social life in 1011 ff. (see on 1028 ff. below).

997. **vermina saeva:** 'writhing pains'. Paul.-Fest. (M.374, L.515) 'dolores corporis . . . quasi a verminibus . . . hic Graece dolor στρόφος dicitur'. The comparison with στρόφος suggests a derivation from *vertere* (Bailey ad loc.), but the popular association with worms may add another horror here: maggots infecting the *ulcera taetra*.

998. **ignaros quid vulnera vellent:** Pliny *NH* 26.145 recommends:

> *ulcera taetra* folia mandragorae recentia, radix volnera cum melle aut oleo, cicuta cum siligine mixta mero, aizoum herpetas quoque ac nomas ac putrescentia, sicut erigeron verminosa, *recentia* autem *volnera* astragali radix et vetera ulcera, quae purgat hypocisthis utraque.

Lines 999–1010

999–1000: at non multa virum . . . | una dies dabat exitio: the Roman military language (see Hellegouarc'h, 1972) puts us in mind of the wars of the late Republic, and this certainly adds force to the comparison, but the criticism is universal and is not restricted to one age or philosophical school, as the Peripatetic Dicearchus' use shows (fr. 24 Wehrli, above on 989–90). The Epicureans would generally be pacifists and political quietists, with perhaps the exception of 'emergency action' allowing them to involve themselves in war and politics (cf. frs. 1.119.6, 52, 55, and 56 Arr.; fr. 551 Us.; *DRN* 5.1129–30; Cic. *Rep.* 1.1–12, *Pis.* 53–63; Plut. *Mor.* 1124D–1127E; see Fowler's excellent study, 1989, 120 ff.), and would view war as one of the unnecessary by-products of civilization, caused by the fear of death (cf. 3.59 ff.), that will disappear in the Epicurean Millennium. According to Diogenes of Oinoanda fr. 56 Smith, 'there will come to be no need of fortifications or laws and all the things which we contrive on account of one another' (trans. Smith).

The proem to book two is illustrative of the Epicurean disengagement from warfare, with the philosopher fortified by Epicureanism calmly viewing the battle below (cf. 2.5–13 with Fowler, 2002, ad loc., cf. Schindler, 2000, 106). Here in book five, the pathetic tone may seem to imply greater moral engagement, but the tone of the comparison between the soldiers fighting and the blind fools struggling to amass wealth and power in 2.7–19 leaves us in no doubt about L.'s view of warfare as contemptible and pitiable (cf. Gale, 2000, 232–40 and 249). The passages 2.1 ff., 3.59 ff., and 5.1120 ff. are closely linked by the intertexts: 'noctes atque dies niti praestante labore | ad summas emergere opes rerumque potiri' 2.12–13 ≈ 3.62–3, cf. 5.1120–32 'potentes | . . . ad summum succedere honorem | certantes . . . | . . . angustum per iter luctantes ambitionis'. This last is the cause of civil war and the murder of the kings in L.'s prehistory of civilization, a stage long thought to owe a good deal to L.'s Roman outlook (it does not appear in Hermarchus fr. 34 LA, or Plut. *Adv. Col.* 1124D; see Fowler, 1989, 142–3. I consider that a similar stage is present in Epicurus' thinking as well (cf. Phld. *De Piet.* 225–31, 265–70, and 1176–1217 with Obbink ad loc.; see Introduction), but clearly Roman history provides L. with a perfect *illustration* of such a period of descent into anarchy. The language in these passages is very much that of Roman politics (e.g. *niti*: Cic. *Planc.* 67; Sall. *Iug.* 4.7; *labor*: see Hellegouarc'h, 1972, 248–51; *emergere*: see *TLL* 5.477.58 ff.; *rerum potiri*: Caelius *ap.* Cic. *Fam.* 8.14.12, Cic. *Rosc. Am.* 70. See Fowler, 1989, 134 n. 64). So, we come round again to a Roman view of warfare and political strife, as well as an Epicurean and universal one, and one both situated in the Republican present and loosely as a period in prehistory.

For the pathetic tone of *una dies dabat exitio* compare Ovid's version for the nearly complete destruction of the Fabii at Cremera, *Fasti* 2.235–6: 'una dies Fabios ad bellum miserat omnes | ad bellum missos perdidit una dies' (cf. *Pont.* 1.2.4, Silius *Pun.* 2.5), and of Lucretius' work, *Amores* 1.15.23–4: 'carmina sublimis tunc sunt peritura Lucreti | exitio terras cum dabit una dies'. Cornelius Severus uses it of the death of Cicero (*ap.* Sen. *Suas.* 6.26): 'abstulit una dies aevi decus ictaque luctu | conticuit Latiae tristis facundia linguae' (cf. Stat. *Theb.* 3.148; App. Verg. *Rosis* 40 on the death of a rose).

1000–1. . . . nec turbida ponti | aequora lidebant navis ad saxa virosque: the lack of death from seafaring is presented as part of the lack of warfare. As is traditional, warfare and seafaring are closely linked (see Appendix B). The Epicurean ethical aspect of this linkage is illustrated by the shipwrecked admiral at 5.1226–32, swept to his death along with his legions and elephants, despite his prayers to the gods. There, the association of war and seafaring is hardly accidental: the admiral is one of the *pectora caeca* of 2.14, who strive for power and wealth, and who, we know from 3.59 ff., are driven to their deaths by the fear of death itself and thus by *caeca cupido honorum* in seeking statues and great names for themselves. He is one of those destroyed in the struggle *ad summum succedere honorem* in 5.1120 ff., and a victim of the *vis abdita quaedam* of 5.1233 that seems to grind down the affairs of men. This is not a natural or divine force (as it is in the cases of the loss of the fleets of the impious Publius Claudius who drowned the sacred chickens, and Junius in Cic. *ND* 2.7 ff.), but a human one that arises from the struggle itself, and it is hidden only from the *caeca pectora* of those who are engaged in the struggle (cf. Yun Lee Too, 1991). See further below on 1006.

1002–5. tum temere incassum frustra . . . ridentibus undis: tum *M. F. Smith*: nec *OQ*: hic *Lachmann*: sed *Lambinus*: sic *Diels*. I accept Smith's emendation as more natural in the context of comparison with the present: 'at that time the sea raged harmlessly'. Note here it illustrates, along with *temere*, *incassum*, *frustra*, and with the 's's of *saepe*, *saevibat*, *minas*, and *inanis*, the sounds of the waves crashing on the shore and then receding better than, in 2.1060, it illustrates the sounds of the colliding atoms.

At 2.1060, the same collection of adverbs *temere incassum frustra* illustrates the repetitive randomness of the collisions of the atoms in the creation of the world. Here with the personification of the sea as a deceitful creature with moods, it underlines that the sea's apparent rages are impersonal and undirected. Without people to be harmed by the 'moods' of the sea, they can, ironically, be seen to be simply part of an impersonal mechanistic process. As the admiral finds out at 5.1229 ff., no amount of prayer to personifications of sea or sky, Jupiter or Neptune, alters the casual impersonal violence of the elements.

1006. A variation on Aratus *Phaen.* 1.110: *χαλεπὴ δ' ἀπέκειτο θάλασσα*, but subject to various unjust attempts at excision since Lachmann (see Bailey ad loc. who defends it). We should be very reluctant to excise a line of L. that tells us that in prehistory a *ratio* was *caeca*. The traditional lack of seafaring in prehistory and the traditional improbity of seafaring (see Appendix B) should be enough to justify its retention; it is exactly what we should expect. Further, these two words are pregnant with Epicurean meaning and irony. Of course, all *ratio* was hidden to the first people, but the effect of this lack of technology was to save lives and increase security, while the lack of *ratio* today, *vera ratio*, drives people to strive for position and wealth, leading them to destroy themselves and others, on the battlefield and *on the sea* (cf. 2.5 ff., 3.59 ff., 5.1120 ff., and see above on 1000–1). Then the *navigii ratio* was *caeca*, now it is the *pectora* of those engaged in the struggle for power and position.

1007–8. tum penuria . . . copia mersat: another moralizing comparison to the disadvantage of the present day. Again, the force is both particular and universal: it may refer in particular to Roman luxury or more generally to modern *mores*. And again, the ethical tone is both Epicurean, and also one that could be adopted by almost any moralist. For Epicurean cultural primitivism in matters of food and drink see above on 938 and introduction to 945–52.

1009–10. As in Hippoc. *De Vet. Med.* 3.26 the prehistoric diet causes death, but here due to ignorance of botany rather than to the rawness of food.

1010. vergebant: of administering liquids, cf. Ov. *Met.* 4.506: 'vergit furiale venenum pectus in amborum'; Stat. *Theb.* 6.211: 'spumantes . . . mero paterae verguntur'.

nunc dant aliis sollertius ipsi: *nudant sollertius ipsi* of OQ is clearly garbled, and has attracted many wild emendations, cf. *nunc se nudant* Lachmann, *nunc dant letum* Marullus, *nurui nunc dant* Munro, *nunc dant soceris* Diels, *nunc se perdunt* Clarke (1970, 10), *contra nunc dant* Smith (1966*b*, 264), but as Bailey says, *nunc dant aliis* of the Juntine edition makes good sense. The comparison is twofold: people *innocently* poisoned *themselves*, now *they themselves deliberately* poison others, hence the repetition of *ipsi*. The first people had no idea of the common good (958) but they were not deliberate murderers. The stimulus for this modern behaviour is of course the fear of death and the concomitant unlimited desires, cf. 3.59 ff., 5.1120 ff. The comparison is reminiscent of Hesiod's Iron Race (*Op.* 176 ff.), and the implicit-comparisons with modern *mores* in Empedocles DK31 B128 and 130.

§6 Lines 1011–1027: The First Societies and the Origins of Justice

Long comparatively neglected, there are now some good recent studies of this passage. See esp. Asmis, 1996; Algra, 1997; and Schrijvers, 1999, 103–18. Among the many studies of the Epicurean theory of justice, see Mitsis, 1987 and 1988; Vander Waerdt, 1987 and 1988; L&S i. 134–9; Long, 1986; O'Connor, 1989; Goldschmidt, 1977; Rist, 1980; and Bollack, 1969. On the Epicurean theory of justice and the prisoner's dilemma see Denyer, 1983; Herman, 1998; and Campbell, 2002*a*.

This brief passage describes three things: the clear differentiation of humans from animals, the formation of the first societies, and the origins of justice. All three are closely interlinked: the first humans soften physically and psychologically by an evolutionary process in response to the new environment of fire, clothes, houses, marriage, and child-care. This evolution into modern humans enables them to perceive the societal value of co-operation, so to form friendship pacts on the Epicurean model, and so to enable the formation of the first village societies. There are other extant Epicurean sources for this stage: Hermarchus fr. 34 LA (Porph. *De Abst.* 1.7 ff. = L&S 22M and N), and Epicurus *KΔ* 32, 33, 39, and 40, which seem also to describe the origins of justice in the first societies.

The *erramento ferino* ends, not with the rise of cities and civilization, as we might expect from other ancient prehistories, but with the formation of informal village societies. Cities arise only in a later stage. Here, we see a major difference between the Epicurean version of prehistory and most others: we are given three stages in prehistory rather than two. More normally the picture would be of a wild wandering stage, with either a positive or negative gloss. This would then come to an end with the rise of cities, and the imposition of coercive legislation, which either ends primitive brutality, lawlessness, and injustice, or ends the just state of the Golden Age, and institutes all the *malaises* of modern civilization (see Introduction).

In this second stage we find the Epicurean theory of justice, retrojected into prehistory as the basis for these first societies. The Epicurean theory of justice is an informally contractarian one, based on the formation of non-aggression pacts (sometimes 'friendship pacts') between individuals. Justice is an entirely relative concept, and is judged in terms of its utility. Thus, justice arises informally and naturally, and is a 'bottom up' rather than a 'top down' process, unlike legislation. Legislation for the Epicureans may or may not be just, according to circumstances: justice is entirely relative to each situation, and may only be judged on the outcome of each action (cf. Epicurus *KΔ* 31–40). There is not, and there never was, therefore, any absolute justice:

there is no pre-existing transcendent notion of justice, but it is a human construct, for the benefit of humans. This is not to say that the Epicurean notion of justice is only theoretical, or that it has application to modern civilized society alone. Here in 1011–27, we see that it was the basis for the beginnings of human society itself: without it no society would have formed, and the human race would have been wiped out before the beginnings of civilization. Justice and the order of society are not divine gifts, nor were they instituted by outstanding human individuals: a peaceful and just existence arose naturally without any such aid, divine or human, and thus we have this second stage in prehistory.

This has of course significant implications for the Epicurean view of the value of civilization and for their view of politics and society, but here in prehistory we find the Epicurean theory at its most powerful, stripped of the accretions of culture and civilization, saving the human race itself from extinction.

There are two particularly problematic details in the passage. First, in 1023 we hear the first villagers explaining to each other that it is fair for all to pity the weak. This, as Phillip Mitsis has said (1988, 106 n. 15 c), assumes a pre-existing notion of fairness that would seem to render it not truly Epicurean.

Secondly, in 1025–7 we are told that had the first people not formed friendship pacts and kept them, the human race would have died out there and then. There is no obvious explanation for such a dramatic catastrophic extinction, given the only moderate level of violence between humans in the previous wild wandering phase of existence, and we are not given an explanation such as that of Plato's Protagoras, who says that because the first people lacked the divine gift of political science, the first gatherings exacerbated the level of violence.

Some light may be thrown on these problems by viewing this passage of L. from a modern evolutionary point of view. Since the publication of the anarchist Prince Peter Kropotkin's *Mutual Aid: A Factor in Evolution*, in 1902, classical Darwinian thinking has struggled to account for the origins of co-operative behaviour, altruism, and justice. Kropotkin pointed out that Nature and human society are characterized as much by co-operation as by competition, and that there is at least as much co-operation and altruism in Nature as competition. Darwin himself had relied upon competition as the driving force of evolution in his theory of natural selection, but his followers, Huxley in particular, laid even heavier stress on competition than Darwin had. Darwin need not be held entirely responsible for the subsequent history of the idea of 'the struggle for life' as a positive evolutionary force, and its use to justify some of the most brutal economic and social policies of the last century, but the idea is at the heart of his thinking, and is still very strong in political and economic thinking, and tends to colour our view of even ancient theories of the origins of justice.

Various attempts have been made over the last century to explain the origins of altruism within the Darwinian framework of natural selection, all of them more or less unsuccessful, or at least only partly successful (for an overview, see Matt Ridley, 1996, 11 ff.). The main difficulty faced by Darwinists has very often been expressed in terms of the prisoner's dilemma (see Denyer, 1983; Matt Ridley, 1996, 53 ff.). In this scenario, two prisoners are charged with the same offence, and in order to extract a confession from them, the police chief offers them both a deal: if they both keep silent (co-operate), they will both be convicted of a lesser offence, and each receive a year in jail. If, however, one confesses and gives evidence against the other (defects), he will be let off free, while the other gets ten years in jail. They are put in separate cells to think it over. Each one reasons thus: 'if I stay silent I will only get a year in jail, which is not too bad, but it is worth my while to confess and so get out free. In any case, I am not sure I trust my colleague to keep quiet for my sake, and so I had better confess before he does.' And so, the one who co-operates and stays silent gets ten years in jail: the least desirable outcome. There are many ways in which the problem may be stated, but they all share one thing: that a rational approach to the problem leads to defection and to the best result for the defecting player. Accordingly, co-operation would seem to have negative value in evolutionary terms: it is not an adaptive strategy, and so co-operation in Nature is left unexplained.

One attempt to get around this has been 'group selection', and this is one explanation that Darwin himself uses (1871, *The Descent of Man*): 'A tribe including many members who . . . were always ready to aid one another and to sacrifice themselves for the common good, would be victorious over most other tribes; and this would be natural selection.' In this a group of creatures more instinctively co-operative than other groups of the same species in food-gathering, hunting, child-care, and so on, would inevitably be more successful, and so out-compete others, and thus breed more prolifically and spread their co-operative behaviour genetically. But this model is vulnerable: critics point out that selection does not occur at the group level but at the level of the individual. What mechanism may operate to promote co-operation at the expense of competition between members of the same group is not clear: the prisoner's dilemma would still seem to operate against selection for co-operation between members of the group.

The other main strand of thought may be described by Richard Dawkins' 'selfish gene' label (see esp. Dawkins, 1976; Matt Ridley, 1996, 11 ff.). Here, co-operative and altruistic behaviour is explained at the genetic level. Put briefly, behaviour that may be directly disadvantageous to the individual organism may well be advantageous to its genes. This may be seen most clearly among social insects such as bees: it is directly disadvantageous to a worker bee to die defending the hive, but in doing so she promotes her genes in the form of the young of the hive, the females of which are at least her half-sisters and some her full sisters. She behaves selflessly, but this result is brought about because her genes behave selfishly. Again, this may be criticized in terms of the level selection works upon. Selection does not take place at the genetic level: genes are simply the carriers of information created by selection at the individual level. Another mechanism must be sought to allow individual and genetic advantage to coincide more neatly.

Both of these mechanisms, group selection and selfish genes, may well play a part in the evolution of co-operation, but both they and the classic model of the prisoner's dilemma presuppose that altruism and self-interest are polar opposites, and that co-operative behaviour is directly disadvantageous to the individual, directly advantageous to the group (or the genes), and only indirectly advantageous to the individual. The work of Robert Axelrod (Axelrod, 1984 and 2000; see Matt Ridley, 1996, 53 ff.), and many others since, has thrown doubt on the validity of this neat polarization. Axelrod noticed that when the prisoner's dilemma was played more than once (reiterated) between the same players, something remarkable happened. At first, as expected, the defectors did well, and suckers (always co-operate) disastrously badly. But as the game progressed, a strategy called 'tit-for-tat' began to thrive. Tit-for-tat simply begins by co-operating, and then does just what each player did to it last time. Thus it will always co-operate with suckers, and defect against defectors. It holds no grudges though, and if a defector changes tactics and decides to co-operate, tit-for-tat will co-operate with it next time. After a while the defectors use up most of the available suckers, and are left playing mainly against tit-for-tat, against which they can make no headway, or against other defectors, which can bring them no advantage. Tit-for-tat soon drives them nearly to extinction and becomes the dominant player. Perhaps even more remarkably, sucker, now that the defectors are weak, begins to thrive by playing with tit-for-tat; both of them behave in exactly the same manner towards one another. Finally, sucker and tit-for-tat have almost equal numbers, and defector struggles to survive. In the limited and artificial world of the prisoner's dilemma then, it can be seen that the former judgement was entirely wrong: competitive selfish behaviour does not give an adaptive advantage beyond the very early stages of the game. A modified and contingent co-operative strategy is the most effective survival technique both directly for the individual organism and for the group. Startlingly, an entirely unmodified and irrational-seeming co-operative strategy 'sucker' or 'always co-operate' is the second best *individual* survival strategy.

Axelrod was looking for a simple strategy that did not involve complicated thinking, or any sentiment or emotion. He predicted that tit-for-tat would be an evolutionarily stable strategy, by which he meant that it would win in any circumstances and conditions. Since the mid-1980s, other more efficient strategies than tit-for-tat have been derived, but they all have one thing in common: they are all more forgiving and co-operative than tit-for-tat.

Nicholas Denyer's (1983) analysis of the status of the Epicurean theory of justice in terms of the old static prisoner's dilemma concluded that the Epicurean model achieves the second best result for the individual, but the best result for the group: a wise person will forgo a direct individual advantage for the mutual benefit of the group, from which she will also, in turn, benefit. This was a fair analysis at the time, but now we may view it differently: the Epicurean model would achieve the best result both for the individual and for the group, and the individual gives up no direct advantage by sticking to the friendship/non-aggression/mutual aid pacts of the Epicurean theory, but receives a direct personal advantage by doing so. As L. puts it in 5.1024: 'it is fair that all pity the weak'. As I said earlier, this involves an appeal to a pre-existing notion of fairness, but if the Epicureans are absolute moral relativists and utilitarians, it cannot be properly Epicurean. Now I may put it in different language, and see what it comes to: from the point of view of a tit-for-tat player of the prisoner's dilemma 'it is a powerful individual survival strategy that all should pity the weak'. This gives us our pre-existing notion of fairness, but in a different form. It is not now an appeal to an absolute notion of fairness that exists somehow metaphysically independent of physical reality, but simply a statement of the true position, that this sort of behaviour will out-perform all others in producing beneficial results for all individuals involved. To put it another way, it is a prediction, based on empirical observation rather than abstract theorizing, of the likely outcome of pitying the weak, and so the notion of fairness appealed to is established as a reference point upon which future decisions may be made. It does not exist independently of human action, but it may be said to pre-exist actions themselves because co-operative behaviour is an evolutionarily stable survival technique. The prehistoric and evolutionary setting of the Epicurean theory of justice parallels this temporal looseness: pragmatic co-operation saved the human race in the beginning, and so may reasonably be used as a model for future survival and success. The previous behaviour of 958–61, where people had learned that aggressive competition was the only survival technique, is replaced by another sort of learned behaviour. Now that the human race has evolved, they are able to make the conceptual leap from their previous conviction to 'it is fair that all pity the weak'. Both are seeming absolutes, but both are really predictions of outcome.

This leads on to the second problem: the extinction of the human race had they not fortuitously hit upon the Epicurean theory of justice, and so survived. Clearly, L. presents an outline of the Epicurean theory of justice: 'nec laedere nec violari' is a translation of Epicurus' *μὴ βλάπτειν μηδὲ βλάπτεσθαι*, 'neither to harm nor be harmed' (cf. *KΔ* 31, 32, 33, 35). But, the setting of it in prehistory gives it a much less theoretical feel. L. is saying that far from being an ideal of justice, the Epicurean model is actually justice in its naturally occurring state: it is how justice came about before the rise of civilization, and so before the imposition of restrictive legislation to curb human wrongdoing, and to produce the limited amount of co-operative behaviour that now enables a civil society to exist. In L.'s account, legislation is a late invention and arises only in a third stage of civilization. First, powerful technocrats become kings and begin to found cities out of entirely selfish motives, then competition for power, wealth, and position leads to revolution and the assassination of the kings, and a state of anarchy follows. Only then, tired of constant strife, do people listen to certain individuals and accept the restrictions imposed on them by legislation for the common good. Legislation is presented as the salvation of civilization, but it is not claimed that the human race would have become extinct had legislation not been invented. In L.'s prehistory, the first humans are depicted behaving selfishly towards one another; they are unable to form any notion of the common good, but there is little explicit violence between them. They simply seem to wander alone with as little interaction as possible. When they see some food they snatch it for themselves rather than sharing it, but we do not see them fighting over it, although we may imagine such things happening. All the explicit violence is between humans and animals, and we may, if we are looking for enough violence to cause the extinction of the human race, see the reference in 5.1025–7 as being towards the survival of the human race through collaboration in the face of wild animal depredations, much as in Pl. *Prt.* 320c ff.; Diod. Sic. 1.8; Cic. *Rep.* 1.25.40; and in Porphyry's report of Hermarchus (fr. 34 LA). But, the tone in 5.1011–27 is quite different. L. speaks of the formation of human relations in terms of the ending of strife between humans and the beginnings of the protection of humans from other humans; of the weak by the strong. It may not be too fanciful to say that it was simply the inefficiency of their former survival strategy that would have led to the extinction of the human race. In terms of Darwinian game theory, the behaviour exhibited by L.'s first humans before the formation of the first societies is the least efficient survival technique, and in less theoretical evolutionary thinking, the development of an ability to co-operate, especially in hunting large game and in the sharing of the meat surpluses this brought with it, is thought to have been one of the evolutionary advantages that enabled modern humans to out-compete archaic humans and so drive them to extinction.

I suggest L. thinks in similar terms, for the following reasons: in 5.780–836, we are given a description of the origins of animals and humans. Humans arise by the same process as the other animals and at the same time. They are in fact one animal species, as we should expect in an anti-teleological account (cf. Anaximander DK12 A30; Empedocles DK31 B71; Xenophanes DK21 B27, B29, B33; Archelaus DK60 A4; Anaxagoras DK59 A1; Pythagoras DK58 C6; Democritus DK68 A139; Epicurus fr. 333 Us.; Diod. Sic. 1.7; see Blundell, 1986, 79 ff.).

In 855–78 we are told that all other animals had special characteristics that enabled them to survive: lions *virtus*, deer *fuga*, and foxes *dolus*. Without these, they would simply have become extinct. In addition, certain animals survived because of their *utilitas* to humans. Dogs, sheep, and oxen entered into a friendship pact with humans, and so they survived. This is clearly an anachronistic retrojection of the beginnings of animal domestication into L.'s scheme of the origins of species, but the force is clear. All the animals that survived had special characteristics without which they would have died out. For some, it was their ability to compete as individuals, and for others, it was their co-operative ability that saved them. Dogs, sheep, and oxen were saved by co-operating, but in the Epicurean theory the benefits of such co-operation are mutual. Since they co-operated with other animals, humans also received a direct benefit, and so the same mechanism also helped preserve the human race from extinction. We may compare Epicurus *KΔ* 32 where a similar picture is given, also associating the formation of the first societies with co-operative human/animal relationships (see L&S i. 135; Blickman, 1989, 168; Müller, 1972, 124 ff.).

Clearly, animal domestication and herding cannot take place before the formation of the first societies in 1011 ff., and so there is a temporal shift in L.'s account: 855–78 must refer to the period covered by 1011–27. Both passages, then, describe the same mechanism of extinction avoidance through co-operation, but only in the second passage is it stated that *humans* were saved by the process. The first passage refers to human/animal co-operation, and the second to human/human co-operation, but the import is the same in each case. The special characteristic that has enabled humans to survive is their ability to co-operate. Had they carried on mistakenly thinking that aggressive competition is the best strategy, they would have died out. Humans do not have the *virtus* of lions, the *fuga* of deer, or the *dolus* of foxes.

Human physical and psychological evolution

The passage 837 ff. has often been wrongly described as a theory of evolution, and as I say above (see introduction to 837 ff.), L. is not an evolutionist in the sense that new species are formed by a process of evolutionary metamorphosis: each species retains its distinctive atomic pattern that ensures it cannot mutate into another species.

Humans are the only animals described by L. as evolving. All the others—we hear about deer, lions, dogs, foxes, sheep, and oxen—appear from the earth complete with their distinctive characteristics. The other creatures that did not have special characteristics have died out, leaving only those we see today. No other species has had to acquire the characteristics that enabled them to survive. This is not to say that the other animals could not evolve and acquire other characteristics in L.'s scheme, but for the purposes of his argument, we are the only species that did so.

The evolutionary change comes about by direct response to environment, and is achieved without any extinctions. It presumably involves the inheritance of acquired characters—standardly accepted in ancient biology, by the Hippocratics and Empedocles, and closely allied to the pangenetic theory of embryology that L. shares (see above on 865; *DRN* 4.1041 ff. with Brown ad loc.; cf. Epicurus fr. 161 Arr. For Empedocles cf. Arist. *Gen. An.* 722^{b}17–30; and Aëtius 5.1.8; for the Hippocratics *Nat. Puer.* 17 (vii.496.19–20); *Genit.* 4 (vii.4747.16–18); *Airs, Waters, Places* 14). The physical and psychological softness acquired in response to fire, houses, sex, and child-care would be passed on to offspring, and so become the new human nature. In 1018, L. speaks of a 'breaking' of the *ingenium* of the early humans: it is permanently altered. In modern terms, this mechanism of evolution is closer to that of Lamarck than to that of Darwin (see Introduction).

So, the differentiation of humans from animals occurs by a Lamarckian evolutionary process at a late stage, and involves the gaining of reason, which leads to the formation of justice. Our co-operative ability is thus the feature that defines our humanity, and enables us to survive. Without it, we would have been simply one of the species preserved only as fossils, like those creatures L. says did become extinct because they lacked special characteristics. As lions are defined by their strength, deer by their speed, and foxes by their cunning, we are defined by our co-operative ability. Thus, the destruction of the human race had the friendship pacts not been kept is explained.

1011. inde: from 925, L. has been describing the life of the earliest humans in their original state of nature, just as they emerged from the wombs rooted to the earth (808). No physical, moral, or technological changes or advances are reported until this point. Humans live without laws (958–9), without any form of co-operation (958–61), and without any arts or technologies. *Inde* signals a change to a description of the first beginnings of human physical and psychological development.

casas: here, houses are introduced, without any explanation, as the first of the three new technologies that will lead to permanent physical and psychological changes in humans. The type of design of these first houses is not of great importance to L.'s argument as in Vitruv. *De Arch.* 2.1, but the fact of their use by humans at this stage is crucial, as will be seen from 1017–20. The single word *casas* here must provide a contrast to the life and dwellings of early humans described in the previous section. Therefore, it needs to carry the meaning of 'a settled, permanent home', in contrast to 'vulgivago vitam tractabant more ferarum' 932, and 'a house in the open countryside', rather than the mountain caves of 955 or the woodland groves of 970–2, and also, 'a home safe from the depredations of wild beasts', rather than the insecurity of the caves at 984–7. Interestingly, given the contrast with caves here, Festus derives *casa* from *cavatio* (Paul.-Fest. 47). This would indicate that *casa* had very primitive associations, and *casa* is often used of the houses of early humans, cf. Varro *RR* 3.1.3: 'quo tempore agri coli sunt coepti atque in *casis* et tuguriis habitant'; Vitruv. *De Arch.* 2.1.7: 'efficiebant in dies meliora genera *casarum* . . . non casas sed etiam domos fundatas et latericiis parietibus aut e lapide structas materiaque et tegula tectas perficere'. *Casa* would also have a rural or rustic connotation, Cicero *Pro Scauro* 25: 'casas aratorum'; Livy 5.3.8: 'in casis ritu pastorum agrestiumque'; Martial 10.96.1: 'repetam saturae sordida rura casae' (*TLL* 3.509.16 ff.).

pellis: naked early humans are an essential ingredient of almost any ancient description of prehistory (except for Pl. *Leg.* 3.676 ff.; Cole, 1990), cf. Tzetzes 137.36 and Diod. Sic. 1.8. Their presence here lends colour and credence to the story and also, as in Diogenes of Oinoanda's argument in fr. 12 Smith, provides L. with an opportunity to show that the invention of what was generally considered to be one of the earliest arts, that of clothing, was of human rather than divine origin. L. follows the traditional rationalist pattern, as in 5.953–4. He leaves the origins of weaving to a late stage in his account at 1350–60. There weaving is closely associated with the discovery of the use of metals and with agriculture, the men being the first weavers and then abandoning the work to take on the heavier labour of the fields.

The brevity of L.'s treatment gives the impression of these three technologies being discovered at the same time since they are telescoped together into one line of poetry. However, if L. is following Epicurus' model (cf. *Ep. Hdt.* 75–6) we would expect early humans to begin learning from the facts themselves almost as soon as they came into existence. Indeed, the process of learning, according to L.'s own conclusion to his account, should not be episodic at all but a steady, if gradual, progression as in 5.1452–3.

ignemque: L. introduces the third and most important new technology, again, as with houses and skins, with no explanation. The origins of fire are discussed at 1091–1101, where the topic is sandwiched between the origins of language and the rise of civilization.

pararunt: 'they procured for themselves', i.e. without the aid of gods, or outstanding humans (for technology as a divine gift see Appendix B). Thus, this one word does duty for the whole argument against fire and technology as the gifts of Hephaestus, Athena or Prometheus. *Parata* in Epicurean terms = εὐπόριστος 'easily available', cf. *KΔ* 15 and 21. L. makes this use clear at 6.9–10 'nam cum vidit hic ad victum quae flagitat usus | omnia iam ferme mortalibus esse *parata*'. Here this Epicurean meaning underlines the ethical dimension of the argument: the early humans were obtaining these new technologies themselves, since they were easily obtainable, as are all the necessities of life in Epicureanism. Diogenes of Oinoanda fr. 12 Smith explicitly rejects any divine grant of technology (see on 1041 ff. below).

1012. coniuncta: often used of marriage, cf. Verg. *Ecl.* 8.32 'digno coniuncta viro' (*TLL* 4.333.17 ff.). L. uses *coniungo* of the female partner in sex at 4.1277 in a basic physical sense, and very often of the union of soul and body as at 3.136, 3.349, 3.579, 4.947, and 5.558. Here we may presume a separation of men and women before this point, with occasional and temporary unions as described at 5.962 (see above).

This *coniugium*, if it follows L.'s normal usage, should imply a permanent union as at 3.845, and the *coniugium* of properties and matter at 2.743, cf. 1.451–4:

> *coniunctum* est id quod nusquam sine permitiali
> discidio potis est seiungi seque gregari;
> pondus uti saxis, calor ignis, liquor aquai,
> tactus corporibus cunctis, intactus inani.

In Epicurean terms a permanent property (συμβεβηκός) rather than an accident (σύμπτωμα) (cf. *Ep. Hdt.* 68–73; Sext. Emp. *Adv. Math.* 10.219–27; L&S i. 36–7). This atomic usage implies an idea of permanent marriage between men and women. Compare the description of sexual unions in cosmogonic terms at 962–3 (see above).

1012–13. concessit in unum | conubium: OQ have 'concessit in unum | cognita sunt. . .'. Marullus assumed a lacuna and conjectured 'castaque privatae Veneris conubia laeta | cognita sunt . . .' for a lost line 1013 (see also Munro ad loc.). If we do not have a lacuna we seem to need a noun to go with *unum*, and so Lachmann conjectured *conubium* for *cognita sunt*. This avoids the need for a whole line explaining marriage, which would seem otiose and verbose in such an economically written account. *Concessit in unum conubium* provides all the necessary contrast with the description of the formerly promiscuous and temporary sexual unions at 5.962–5, meaning: 'agreed to enter into one single, permanent, and proper marriage'. L.'s only other use of *conubium* is at 3.776, there used of animals mating. I can find no exact parallel for *concedo in conubium*, but cf. Just. 24.2.10: 'Arsinoe . . . concessit in matrimonium fratris'; Ov. *Am.* 2.7.21: 'Veneris famulae conubia liber inire'; Hyg. *Fab.* 89.5.2: 'Telamoni concessit in coniugium, ex quo natus est Teucer' (*TLL* 4.9.1 ff.). Cf. also Stat. *Theb.* 4.275–9, which seems to echo L.:

> Arcades huic veteres astris lunaque priores,
> agmina fida datis, nemorum quos stirpe regenti
> fama satos, cum prima pedum vestigia tellus
> admirata tulit; *nondum arva domusque nec urbes*
> *conubiisve modus*; quercus laurique ferebant

(see also above on 973 ff.). Another echo is found in Ovid's condensed Lucretian prehistory in *Ars. Am.* 2.478: 'constiterant uno femina virque loco'. On the other hand *concessit in altum* at 4.918 suggests that *concessit in unum* is possible, and so could make a lacuna more possible (cf. *OLD* s.v. *unum* 4b). Further, there could be an echo of Empedocles' cosmogonic language, 'all things come together into one only', cf. 35.5 D.K.: συνέρχεται ἓν μόνον εἶναι, fr. a(ii) 17 M&P: [εἰση]ρχόμεθ' ἓν μ[όνον εἶναι]. L. similarly uses Empedoclean imagery to describe the mating of the first humans in the woods (see on 962 above), drawing an analogy between cosmogony, zoogony, and embryology. Here a similar analogy is given between the joining of people in marriage and the joining of the elements in the formation of the world and of animal life. Whichever reading we accept, the basic meaning is clear, the creation of a stable nuclear family.

1013. prolemque ex se videre creatam: the subject of *videre* should be the men, and it is possible that a lacuna included a reference to men being affected by their new marital state.

Presumably women would not at this point *begin* to engage in child-care. L.'s point would be that now houses, fire, skins, and permanent cohabitation existed, *men* for the first time began to have some part in child rearing, where before they had wandered off after sex. There would seem to be two different ways of interpreting this phrase.

Firstly, simply that the men *saw* the children born from themselves. Secondly that the men *realized* that children were created from themselves, where before they had not realized that sex leads to childbirth and so had no idea of family relationships.

The first reading would supply the necessary physical contact with children for the psychological change described at 1017 and 1018. The second reading would provide both this physical contact and also a much greater impetus for psychological change with a sudden realization of kinship.

The second would seem to be the one most likely to have the greatest impact upon the people L. had described previously. It can be argued that not to know the connection between sex and childbirth would suggest a very foolish people and that L. has shown at 973–81 that his early humans were not fools. However, until very recently certain peoples either did not know of the connection or denied that it was valid, the Trobriand Islanders being a famous example (curiously, the Trobrianders, for their own society, are correct since, although they are sexually active and promiscuous from an early age, the women rarely fall pregnant until they are married. See Malinowski, 1932, ch. 7).

1014. genus humanum: recalling 5.925–30. Clearly, despite the physical and psychological differences from modern humans, L. regards the earliest humans as the same species, although he does qualify them with *illud* at 925, which implies a division into sub-species of *genus humanum* (for the looseness of L.'s taxonomic terminology see above on 855). Modern taxonomy has similar difficulties in deciding when our ancestors became fully human, and what terminology should be used for people such as Neanderthals, and other more archaic proto-human creatures. Generally a progression is drawn from hominoids, to hominines, hominids, early *Homo*, such as *Homo rudolfensis* and *Homo habilis*, then *Homo erectus*, *Homo neanderthalensis*, and finally *Homo sapiens*. None of these terms is free from controversy, and especially the relationship between ourselves and Neanderthals is still in doubt (see Lewin, 1998*b*, 156ff.; and Wood and Collard, 1999, 11–23). In particular, the possibility of interbreeding between *Homo sapiens* and Neanderthals would make a nonsense of assigning them to separate species, but would also lead to the invention of spurious *sub*-species such as 'Homo sapiens *sapiens*', based on criteria other than those strictly allowable under the main definitions of species (see above on 855).

L. has only one evolutionary stage to cope with, but still wisely avoids attempting taxonomic exactitude.

mollescere coepit: here we see the only truly evolutionary change in L.'s account. The previously tough beast-like humans of 925–1010 are now seen changing into modern humans. The process occurs in the Lamarckian rather than the Darwinian manner, by the direct effects of environmental change, and we may assume that it involves the inheritance of acquired characters (see Introduction).

As L. explains (1015 and 1018) this is both a physical and a psychological softening or mellowing. The physical changes, although great, are not so important in L.'s argument on the origins of society as the psychological ones. *Coepit* indicates the beginning of a process of softening rather than a sudden transformation, and again, L. is compressing generations of evolution into a single line.

He describes a physical decline along with psychological advance. However, his early humans are, although physically admirable in some ways, coarse, as is their food, cf. 926 and 944, and physically and behaviourally similar to wild animals, cf. 970. So, although it involves a loss of strength and speed, cf. 966–7, the physical change is one of refinement rather than simply degeneration. However, humans do lose some of their independence, and so are forced to become more indoor creatures, and so forced into closer communication and interdependence with one another, which of course accelerates the softening process in a circular manner, with love, sex, and family life softening them further still.

The process would seem also to be one of the feminization of these early humans, especially given the context of Venus as the principal active in the change (I am grateful to Matthew Leigh for this point). We may compare Latin etymologies of *mollis*:

Isid. *Orig.* 10.179: 'mollis, quod vigorem sexus enerviati corpore dedecoret, et quasi *mulier emolliatur*'; id. 11.2.18: '*mulier vero a mollitie*, tamquam *mollier*, detracta littera vel mutata, appellata est *mulier*'. Cf. also Velleius Paterculus 2.88.2. Caesar, in his Gallic ethnography, puts forward a similar idea, *B. Gall.* 1.1:

> Horum omnium fortissimi sunt Belgae, propterea quod a cultu atque humanitate provinciae longissime absunt, minimeque ad eos mercatores saepe commeant atque ea quae ad effeminandos animos pertinent important.

From 1016 on we can assume that L. is describing people who are physically the same as ourselves, and are now clearly differentiated from the animals for the first time. They are now no longer *saetigeris . . . pares subus* as in 970, and so, although not mentioned by L., as in Hermarchus fr. 34 LA, would be forced to band together in defence against wild animals, and so once again physical softening would aid the development of co-operation, cf. Cic. *Rep.* 1.25.40 (Lactant. *Div. Inst.* 6.10.13); Pl. *Prt.* 320c ff.; and Diod. Sic. 1.8.2–3 (see above on 990).

1015. ignis: fire has been introduced at 1011 and now is shown having its effect upon the early humans. See on 1091 ff. below.

alsia corpora: *alsia* is unparalleled in Latin as a positive adjective. Cicero twice uses a comparative form in *Ad Q. fr.* 3.1.5, and *Ad Att.* 4.8a.1. -Paul. Fest. P.6, 'algeo ex graeco ἀλγέω ducitur, id est doleo, ut sit frigus dolor quidam membrorum frigore conlectus'. The meaning here would be 'tender', i.e. 'unable to bear cold'. The more normal adjectival form would seem to be *alsiosus* or *algiosus*, e.g. Pliny *NH* 21.60 of tender plant cuttings: '*plantaria* habrotoni *alsiosa* . . . admodum sunt'. Cf. Schol. Hor. *Sat.* 2.3.5 *algiosus* of people: '*algiosus Horatius fuit* . . . et ipse sese *inpatientem frigoris* probat in libris epistularum' (*TLL* 1.1724.34 ff.).

1015–16. alsia corpora frigus | non ita iam possent caeli sub tegmine ferre: 'Their now tender bodies were unable to bear cold under the open sky as they had been before.' There is a compression of thought in 1015 whereby fire causes their bodies to become tender but the tenderness is already assumed, thus underlining the circularity of the process.

1016. non ita iam: early modern humans do not show any signs of cold-adaptation in their physical remains. L. assumes that they were cold-adapted and heat-adapted at 929: 'nec facile ex aestu nec frigore quod caperetur' (the two ideas are mutually exclusive in modern thinking). Again the resemblance is nearer to our ideas of Neanderthals, cf. Stringer, 1993, 99:

> The Kebara man most resembles cold-adapted populations in the height/hip breadth relationship; in fact his body proportions are even more pronounced than those of any modern examples. We conclude that even in the relatively warm climate of the Middle East, the Neanderthals were fundamentally cold-adapted people; this is in marked contrast to the early modern humans, both in this area (Skhul and Qafzeh) and in Europe (the Cro-Magnons).

caeli sub tegmine: cf. *sub tegmine caeli* 2.663, and *sub caeli tegmine* 1.988. Possibly a borrowing from Cic. *Arat.* 47: 'ales avis lato sub tegmine caeli | quae volat'; 233 and 239: 'caeli sub tegmine'; and 346: 'caeli de tegmine'. The Greek equivalent idea is not found in Aratus himself, and perhaps the phrase is of Ennian origin rather than Cicero's own coinage (Clausen, 1994, *ad* Verg. *Ecl.* 1.1). The phrase is clearly ironic in tone; *tegmen* = a covering or bodily protection, therefore: 'under the protection of the sky which is no protection at all', cf. Verg. *Ecl.* 1.1: 'Tityre, tu patulae recubans sub tegmine fagi' (cf. *G.* 4.566); and Numitorius' play on the ambiguity, *Vita Donati* 43: 'Tityre, si toga calda tibi est, quo tegmine fagi?'

In the other two examples in *DRN*, L. seems to use this as little more than a resounding phrase for 'under the open sky'. Here the use would seem more pointed. The life of L.'s early humans was, for the most part, *caeli sub tegmine*, but since they now have houses and are unable to bear the cold of outdoors we should expect this to suggest that now their life is lived much more indoors. Thus they would be forced into closer and more prolonged proximity with each other and so allow the working of *Venus . . . puerique* to take effect in 1017. L. is both giving a reason for the invention of houses, and describing their effect.

1017–18. Fire has softened the physical constitutions of early humans so that they are unable to bear the cold of outdoors and so houses have become necessary. The indoor life has led presumably to more frequent sex and closer physical proximity which in turn has caused a further physical and temperamental softening. Now the recognition of their paternity of children and their new involvement in child-care causes the fathers to change their natures fundamentally.

1017. Venus: for Venus in L. see above on 783 ff., and 811. As signalled in 1014, fire has brought about a physical softening, and now Venus is shown effecting further physical and also psychological changes. Her earlier role as the force behind promiscuous lust (963), rape (964), and prostitution (965) has now altered and her nature seems nearer to Venus Caelestis than Venus Vulgaris. Accordingly we should expect Venus here to imply physical love, but with shades of L.'s other uses: a reflection of the divine perfection upon earth and a fundamental principle of nature. L. would seem to be unique among ancient writers in having love as the motive force for human evolution, except for Ovid in a clear Lucretian echo, cf. *Ars Am.* 2.473–7:

> tum genus humanum solis errabat in agris,
> idque merae vires et rude corpus erat.
> silva domus fuerat, cibus herba, cubilia frondes
> iamque diu nulli cognitus alter erat,
> *blanda* truces animos fertur mollisse *voluptas*.

(SeeWatson, 1984)

For Ovid the pleasure of love softens the savage spirits of early humans. Clearly, he has understood this passage as referring to a psychological change. L. leaves it less clear both whether Venus is simply sex or a more emotional bond, and also whether her effect is only upon the physical natures or also upon the psychological natures of early humans.

viris: cf. 964: 'vel *violenta viri vis* atque impensa libido'. As a contrast to 964, we should expect *viris* here to have some meaning of 'violent natures' as well as 'physical strength'. This is supported by Ovid's echo of this passage in *Ars Am.* 2.477: 'blanda truces animos fertur mollisse voluptas'. Again, the close juxtaposition of this phrase to 'puerique parentum | blanditiis facile ingenium fregere superbum' gives this impression as does the alliteration. L. usually has *vires* in a neutral sense, but the word can pass over into excessive masculine aggression. He often links Venus and *vis*, cf. 1.13: *perculsae corda tua vi* and 4.1113–16, 4.1121, 4.1172, and *vir* is also closely linked to *vis* in traditional etymologies (see Maltby, 635).

puerique: cf. 2.604–5: 'quia quamvis effera proles | officiis debet molliri victa parentum'. Here L. has reversed the standard roles of parent and child, although there is no suggestion that the children are actually morally superior to their parents. Their mellowing effect is produced simply by their presence and by the enforced proximity of parents and children in their new domesticity.

parentum: we can presume that mothers were the sole carers of children during the earlier wandering phase. They would always have been affected by the blandishments of their children, so the *parentes* here affected for the first time should be the fathers, unless L. is imagining that there was a lack of efficient child-care on the part of men *and women* as is, perhaps, suggested in 1026–7. Certainly the new domesticity of women also could bring about a change in them to more caring behaviour than before. But it seems more likely that L. is describing primarily a change in male behaviour.

1018. blanditiis: cf. Publil. B13, 'blanditia, non imperio fit dulcis Venus'; Tibull. 1.9.77: 'blanditiis vult esse locum Venus' (*TLL* 2.2034.26 ff.). The children's method of persuasion is that of Venus herself.

facile: if we translate this 'easily', as do Bailey and Latham, it would underline the effectiveness of the children's blandishments. Also it would suggest that the fathers were ready to be affected by their children now that fire, houses, and Venus had softened them up. Munro's 'soon' has some of the feel of both the above. Perhaps, as well as the swiftness and ease of the success of the children's blandishments, *facile* describes their quality, i.e. 'pleasantly', giving a nice contrast with *fregere*, which the alliteration highlights.

ingenium: the fundamental nature of the early humans. *Ingenium* is often contrasted with *ars*, cf. Cic. *Ad Q. Fr.* 2.10.3: 'Lucreti poemata , ut scribis, ita sunt, multis luminibus ingeni, multae tamen artis'; Pliny *NH* 35.74: 'cum sit ars summa, ingenium tamen ultra artem est'. Here the early human *ingenium* is broken to allow the development of *artes*, cf. Nep. *Di.* 1.2: 'ingenium docile, come, aptum ad artes optimas' (*TLL* 7.22.35 ff.). Now they will develop a new psychological make-up, in which co-operative, caring, and pitying behaviour becomes instinctive (see below on 1021 *commendarunt*).

fregere: the fundamental psychological make-up of the early humans is not simply altered but broken. The evolution described here is not strictly driven by utility, and the value of such a psychological change becomes clear only later. It is, however, Lucretian. We may reasonably assume that, in the Lamarckian manner, the new psychological make-up acquired by this softening process is passed on to offspring, and so will replace the old, thus becoming permanently the new human nature (see introduction above). For humans with their slow-maturing offspring, an innate psychological inclination towards caring for children is as much a mechanism for survival as strength for lions (5.862) and cunning for foxes and speed for deer (5.863).

superbum: the former selfish, aggressive, and competitive behaviour of early humans as in 960–1:

> quod cuique obtulerat praedae fortuna, ferebat
> sponte sua sibi quisque valere et vivere doctus.

Cf. the behaviour of the first kings in 1107–9, when decline had set in.

1019. L.'s early humans have undergone the physical and psychological changes that make them the same as ourselves. Now they are able to begin to develop the two distinguishing arts of humans, law and language. L. describes the development of law first, although he does suggest that the development of language was going on at the same time with *balbe*, 1022. See below on 1028 ff.

amicitiem: *amicitia* is often used of political alliances (*TLL* 1.1893.77 ff.), cf. *KΔ* 27 and *Vatican Sayings* 23, *φιλία*. L. bases the first law upon friendship. He gives the nature of this friendship as *nec laedere nec violari*, 1020. Thus, *amicitia* here seems based upon a pragmatic utilitarian motive with no sentiment involved. This would fit Epicurus' approach to justice and law as in *KΔ* 31–40, and particularly *KΔ* 33. However, Epicurus does seem to have had a more sentimental idea of *friendship* than this would suggest, or even to have seen friendship as a good in itself (cf. *Vatican Sayings* 23 and 52. See Mitsis, 1988, and Goldschmidt, 1977). Another indication that Epicurus saw friendship as more than a practical arrangement is quoted by Seneca, *Ep. Moral.* 19.10:

> ante inquit [Epicurus] circumspiciendum est cum quibus edas et bibas, quam quid edas et bibas. nam sine amico visceratio leonis ac lupi vita est.

Also in *KΔ* 27, Epicurus places friendship above justice as the greatest of all blessings of Epicureanism. So Epicurus' own approach to friendship may not have been as severely utilitarian as has often been claimed (see Vander Waerdt, 1987).

We may presume that L. had more of Epicurus' works to follow than we do (Sedley, 1998). Accordingly it is not safe to claim that he is *introducing* a more sentimental approach to friendship and justice into Epicureanism, although (as lines 1021–3 will show) L. certainly seems to be going beyond the needs of strict pragmatism and giving Epicurean justice a more humane aspect. So it is possible that L. is not entirely unorthodox in basing justice on a less than entirely utilitarian view of friendship. Here the *amicitia* does not seem to arise from utility as in *Vat.* 23 but from a more spontaneous and more nearly altruistic motive. The results are pragmatic (see O'Connor, 1989).

iungere: again, as with *coniuncta* in 1013, in an Epicurean text we should expect this to imply a very strong bonding according to the atomic theory. The friendship pacts described here would not be easily broken.

1019–20. aventes | finitimi: thus reports manuscript Q. O has *abentes*, corrected, by the hand of Dungal (head of the palace school of Charlemagne, and successor to Alcuin), to *habentes* followed by *finitim*. It seems clear that the scribe has made a phonetic error, confusing 'v' and 'b' (an error common in both manuscripts, cf. 1022 *balbe* O: *valve* Q), and that Dungal has made the confusion worse by his false correction. Marullus has *aventes*; the other editions, until Lachmann, printed *habentes*.

That these neighbours are eager to form the friendship pacts suggests a contrast between their motives for instituting law and the description at 1143–50 of the motives for submitting to legislation. There exhaustion with a life of violence and revenge makes people willing to be bound by restrictive laws. Here the willingness seems to come more from a realization of the benefits of co-operation following on naturally from their new understanding of the benefits of child-care. Hence they are seen behaving according to *Ep. Hdt.* 75–6, learning directly from experience. It is not clear whether these *aventes finitimi* are to be seen as early examples of 'ingenio qui praestabant et corde vigebant' (1107), but *finitimi* more naturally refers to whole peoples, and it would suit L.'s anti-teleological purpose far better to avoid any suggestion of a νομοθέτης. Especially in showing that this, the earliest justice, came about as a natural progression from the mellowing of humans, outstanding individual teachers are unnecessary. It is useful to compare an account by Cicero that shows Lucretian echoes, *Pro Sestio* 90–2:

"Pro Sestio

> Quis enim nostrum, iudices, ignorat ita naturam rerum tulisse, ut quodam tempore homines nondum neque naturali neque civili iure descripto, fusi per agros ac dispersi vagarentur, tantumque haberent, quantum manu ac viribus per caedem ac vulnera aut eripere aut retinere potuissent? Qui igitur primi virtute et consilio praestanti extiterunt, ii perspecto genere humanae docilitatis atque ingenii dissipatos unum in locum congregarunt eosque ex feritate illa ad justitiam atque mansuetudinem transduxerunt. Tum res ad communem utilitatem, quas publicas appellamus, tum conventicula hominum, quae postea civitates nominatae sunt, tum domicilia coniuncta, quas urbes dicimus, invento et divino iure et humano ut moenibus saepserunt. Atque inter hanc vitam perpolitam humanitate et illam immanem nihil tam interest quam jus atque vis.

Anche nel de [illegible]

Note how Cicero is able, with the aid of his outstanding individuals, to slip in divine law in what otherwise could be an Epicurean account. Cicero has co-operation being imposed from above, where L. describes it as a natural development.

Seneca reports Posidonius following a similar pattern, *Ep.* 90.5 (Posidonius fr. 284 E–K):

> Illo ergo saeculo quod aureum perhibent *penes sapientes fuisse regnum* Posidonius iudicat. Hi continebant manus et infirmiorem a validioribus tuebantur, *suadebant dissuedebantque et utilia atque inutilia monstrabant*.

On the other hand, the account of Hermarchus fr. 34 LA does stress that teachers were needed at this stage. Hermarchus gives a strictly pragmatic motive for co-operation. The early humans do not refrain from killing each other from any fellow feeling or sentiment. Co-operation would not seem to be in their natures in this account, and thus needs to be taught by those who are able to see its benefits. L. has co-operation arising from a fundamental change in human nature, making justice innate in humans, and thus requiring no teaching.

1020. inter se: L. stresses that the friendship pacts came about by consensus between neighbours rather than being imposed from above.

nec laedere nec violari: clearly a translation of Epicurus' *μὴ βλάπτειν μηδὲ βλάπτεσθαι* of *ΚΔ* 31, 32, 33, and 35. Thus, the justice described here is flagged as Epicurean justice, and we may even see this as a direct following of a passage of book 12 of *Περὶ Φύσεως*. It can be argued that Epicurean justice is out of place in the remote past ages before Epicurus himself discovered it. However, it should be remembered that Epicurean justice is not an ideal that needs to be striven after with much thought and learning but, as with all Epicurean good, a simply and easily obtainable state of being.

It would seem from L.'s own account of Athens as the benefactor of humankind that Epicurus' teaching was to heal the minds of essentially civilized or urban people (cf. 6.1–23). Presumably before the imposition of legislation (which may or may not be just, cf. *ΚΔ* 37 and 38) the Epicurean model of justice was easier to obtain since it was not overlain by, and thus impeded by, arbitrary and absolute rules. In a civilized context Epicurus' teaching becomes more necessary. Diogenes of Oinoanda fr. 56 Smith, in describing the other end of time, gives his view of the relative importance of Epicurean justice and legislation and civilization. Thus, then, it can be seen that L. is quite correct, according to Diogenes, in placing Epicurean justice in prehistory. To the Epicureans friendship pacts were *true justice*. That is justice as a fact which existed in the past, exists now (overlain by legislation and civilization), and will exist in the future when the spread of Epicureanism has rendered the contrivances of civilization unnecessary.

Since justice already existed at an early stage in human development, growing naturally from human nature, there is no need for a νομοθέτης to bring it to humankind. Indeed all that could be, and was, brought was legislation, when struggles for power, wealth, and position had rendered it necessary (cf. 5.1105–60). Legislation, inescapably, was imposed by a few outstanding individuals (cf. 1143). Hermarchus fr. 34 LA gives a rather different reason for the institution of legislation: that the friendship pacts broke down once the need for protection from wild animals had been removed, and so legislation became necessary. For L. the strife that eventually led to legislation arose from more specific causes: the rise of religious error instituting the fear of death and its concomitant strife (see introduction above). Note also that L. does not pass directly from friendship pacts to legislation as Hermarchus does. In his account, kingship intervenes as, perhaps, we should expect in a Roman treatment of the development of civilization (see Fowler, 1989, 141 ff.).

1021–3. L. has done all that is strictly necessary in Epicurean terms. He has shown that justice was perfectly able to arise without an original νομοθέτης or any divine intervention, whether direct or indirect. Following Epicurus' canonics in *Ep. Pyth.* 86–7, he should perhaps stop here, rather than going on to describe the further details of these pacts. Epicurus is speaking of the investigation of celestial phenomena, but it seems clear that prehistory should be something 'unknowable by its nature', and so its investigation should follow the same rules (see Schiesaro, 1990, 97–101 'Le analogie diachroniche'). It also seems clear, however, that L. thoroughly understands Epicurus' canonics, 5.1445–7:

> . . . nec multo priu' sunt elementa reperta.
> *propterea quid sit prius actum respicere aetas*
> *nostra nequit, nisi qua ratio vestigia monstrat.*

Accordingly in 1021–3, L. would be deliberately going beyond what Epicurus would consider allowable in giving only one possible cause of justice. However, these lines do follow on naturally from L.'s theme of love and family life as the motive forces for social evolution, and the argument would seem incomplete without them. L. now transcends direct self-interest as the basis of justice.

It is not clear whether here we see a second stage in the evolution of justice, but we do see a positive force now added to the negative *nec laedere nec violari*. There does seem to be a huge conceptual gap between the pacts 'neither to harm nor be harmed' and 'it is fair that all pity the weak'. In the first we see the strong, presumably the men, arranging a utilitarian system of justice between themselves as equals, but in the second the pact extends to the protection of the weak by the strong. The weak cannot strictly engage in the first part of the pact *nec laedere*, and so this transcends the basic non-aggression pacts. However, with *et*, L. links this altruistic behaviour directly to the formation of friendship pacts, and the ability to co-operate has arisen from the effects of family life and the care of children. Now altruism has arisen from the same source, and extends towards the women and children. It seems clear that L. has not simply tacked these ideas onto his account, and that altruism is fundamental to his argument, with 1021–3 following almost inevitably from the force of 1011–20. We may still see this as part of a strictly utilitarian system of justice, however, if we view it from the point of view of the prisoner's dilemma. There pity for the weak, in the form of tit-for-tats (the strong) refraining from defecting against suckers (who are the weak in the sense that they cannot retaliate), results in a direct personal advantage for the strong. In short, altruistic behaviour need not involve personal loss, and selfish behaviour does not bring personal gain overall. The old polarization between selfishness and altruism is removed by reiterated versions of the prisoner's dilemma, but it would seem that L., at least, has anticipated this advance in these lines.

1021. commendarunt: Costa ad loc.: 'i.e. to each other for protection', cf. Catullus 15.1–2: 'commendo tibi me ac meos amores | Aureli'; Cic. *Fam.* 2.6: 'nunc tibi omnem rem atque causam meque totum commendo atque trado'. The subject would be *aventes finitimi*. They are pictured extrapolating from the lessons they have learned at home, and applying the results to the women and children of other families in a positive development of the negative *nec laedere nec violari*. Their behaviour here seems close to Stoic οἰκείωσις, the natural human impulse to love their fellows mentioned by Hermarchus fr. 34 LA (Porph. *De Abst.* 1.7.1) as a possible auxiliary cause of the rise of the first

οἰκείωσις

justice (see Vander Waerdt, 1987). L. places it at the heart of his argument. We may see this as an evolutionary development. Clearly, there was no instinctive οἰκείωσις in the *erramento ferino*, and the first friendship pacts had to be learned intellectually, but with the inheritance of acquired characters (see introduction above), then we may see this learned behaviour being passed down to offspring as an instinctive response to women and children. This would remove the problem of this more sentimental approach to life being not strictly Epicurean: the first humans had no fellow feeling, then they evolved and learned to behave as if they had fellow feeling, and by doing so eventually it became part of the fundamental human psychological make-up. Modern humans, then, will have instinctive fellow feeling, while at the same time justice and friendship will still have a fundamentally utilitarian basis, just as Hermarchus says. The process is very similar to that of the gaining of the instinctive use of linguistic ability in 1033 ff. (see below).

muliebreque saeclum: cf. 4.1227, and *muliebre genus* 5.1355. L. does not see women as a separate race or species, since in 4.1227–32 he states that both parents contribute their own genetic material to a child, rather than the father's seed determining the form of the embryo as in the Aristotelian theory, which would make such a separation of men and women into separate races more possible (see above on 865). *Muliebre saeclum* is found only in L., but many writers use similar phrases without any particular taxonomic implications for gender, cf. Sisenna, *Hist.* 80; Livy 31.44.4; Tac. *Hist.* 5.13.3: *muliebre secus*; Val. Max. 8.3.3; Tac. *Ann.* 4.62.2; Suet. *Aug.* 44.3: *muliebri stirpe* (*TLL* 8.1567.71 ff.).

Note the change from the scene of rape at 964. As with the change in learned behaviour from 960–1 and selfishness as the only survival technique to 'it is fair that all pity the weak' as the only survival technique, the change from the arbitrary raping of women to their universal protection is just as dramatic. We may also see a pointed contrast with the traditional Roman foundation myth of the rape of the Sabine women. Ovid certainly mocks the myth and its incongruity as an *exemplum* of Roman *virtus* in *Ars Am.* 1.89 ff., and in *Ars Am.* 2.473–7 gives a potted version of this passage as an aetiology for the civilizing force of love.

1022. vocibus et gestu cum balbe significarent: *voces* and *gestus* are commonly yoked together, cf. Suet. *Tit.* 8.2: 'et voce et gestu', Pliny *Epist.* 8.14.20: 'non tantum . . . verbis, sed manu gestuque demonstrat' (*TLL* 6.2.1970.16 ff.). But *balbe* here indicates that the setting is that of the origins of language, with the formation of justice made possible by the development of the first efficient communication system which, although primitive and still relying heavily on gesture, is advanced enough to transmit complex ethical concepts (see further below on 1028 ff.).

Unless we have a sudden change of subject it would seem more natural that the *aventes finitimi* are the subject of *significarent.* Bailey ad loc. makes the children the subject, considering that *balbe* should describe their speech. Watson ad loc. reads *vocibus et gestu* with *commendarunt* as well as with *significarent*, correctly assuming that these people had as yet little spoken language between themselves, rather than that the neighbours did not understand each other's languages. The children certainly are the instructors of the new morality but not in Bailey's direct way.

L. has placed the development of civil society alongside the development of language, as does Vitruvius, *De Arch.* 2.1:

> post ea requieta propius accedentes cum animadvertissent commoditatem esse magnam corporibus ad ignis teporem, ligna adicientes et ita conservantes alios adducebant et *nutu monstrantes* ostendebant quas haberent ex eo utilitates. . . . ergo cum propter ignis inventionem *conventus initio apud homines et concilium et convictus esset natus*, . . .

(See below on 1028 ff.)

L. places the development of an advanced moral concept at a very early stage in human development. Altruistic behaviour is shown not as a product of civilization, nor introduced by laws, but as a natural extension of co-operative behaviour. The picture of early humans explaining altruism inarticulately, before the development of a fluent spoken language, underlines L.'s point that this behaviour is fundamental to human nature and required no exterior instruction.

1023. Here L. may seem to abandon completely the utilitarian model of Epicurean justice, but as I say above it may still be seen as part of a utilitarian scheme. At first sight this seems to be a moral absolute, which cannot be properly Epicurean according to *ΚΔ* 37, as Mitsis says (1988, 106 n. 15 c):

> The appeal to a prior standard of fairness (*aequum*) in 1023 has no place in Epicurean discussions of friendship, nor does *concordia* (1024) with its implications of widespread social harmony.

While Mitsis' point about *concordia* can be partly answered by appealing to Diogenes of Oinoanda fr. 56 Smith, and the Epicurean dream of bringing concord to the entire world through their ethical teachings, the absolute claim that it is fair that all pity the weak is problematic. The problem can be solved simply in one way, by saying that this is L.'s own view of Epicurean justice, putting a human face on the harsh utilitarianism of Epicurus' moral relativism, or that L. perhaps gives us a later development of Epicurean theory. Alternatively we can ask whether Epicurus was an absolute moral relativist. *Vatican Sayings* 23 suggests he was not:

> *Πᾶσα φιλία δι' ἑαυτὴν αἱρετή· ἀρχὴν δὲ εἴληφεν ἀπὸ τῆς ὠφελείας.*
>
> All friendship is desirable in itself, though it starts from the need for help.

This would seem to be equally as 'un-Epicurean' as L.'s assertion that pity for the weak is an absolute good.

Alternatively, we need not assume that the voice of 1023 is L.'s own. He may be simply saying that this is the way that the early humans explained the social utility of pity for the weak to one another.

Further, when viewed from the modern evolutionary perspective of the prisoner's dilemma, the phrase may be interpreted as 'pity for the weak is a powerful survival strategy for both individual and group', and so the appeal to a pre-existing notion of fairness may be seen as, rather, a prediction based on past experience of the likely outcome of such pitying behaviour. This is entirely in keeping with the Epicurean theory (see introduction above).

L. is quite correct to place pity for the weak in prehistory. Recent excavations at Shanidar (Iraq) and Krapina (Croatia) have discovered the bones of Neanderthals, some of them showing long-healed injuries so severe that they would have rendered the victims quite unable to look after themselves, let alone gather their own food. This shows that they were nursed, cared for, and fed by their fellows, even though they would have been a net drain on the group economy (see Stringer, 1993, 94).

1024. Costa describes this as 'a realistic note', presumably assuming that L.'s theory is optimistic wishful thinking. But L. has been realistic according to his own philosophy: the prehistoric setting shows that L. describes a pragmatic mechanism of justice, rather than a hypothetical ideal. Co-operation does not need to be universal for it to be an effective survival technique. Society does not break down if some people refuse to co-operate. In the prisoner's dilemma, this can be seen at its most impressive: an original balance of equal numbers of 'suckers' (always co-operate), 'tit-for-tats', and 'defectors' (never co-operate) leads to near-universal harmony, and the marginalizing of the defectors as the least effective survival technique. In the Epicurean theory, as in the prisoner's dilemma, there is no overall individual advantage to be gained by defecting. Thus, instead of being a woolly-minded liberal pipe dream, the Epicurean theory is the most pragmatic and realistic approach to justice.

concordia: as Mitsis has noted (see on 1023 above) *concordia* has implications of widespread societal harmony, which he considers to be out of place in an Epicurean work. From Diogenes of Oinoanda's use of φιλαλληλία in fr. 56.I.8 Smith as the future state of the world, it can be seen that later Epicureans, at least, could conceive of Epicurean justice as transcending narrow self-interest, and as being the basis of universal peace and concord. The usual Greek equivalent would be ὁμόνοια (*TLL* 4.83.25) and is much more a Stoic than an Epicurean concept, cf. Zeno *Stoic.* 1.61, and 3.160; Cic. *ND* 2.79: 'quodsi inest in hominum genere . . . concordia' (*TLL* 4.83.43). Here L. has *concordia* as the result of Epicurean justice, making it clear that he views Epicurean justice in a similar way to Diogenes, and certainly in a far broader universal role than we can see in Epicurus' own extant works. This is not to suggest, however, that Diogenes and L. are unorthodox, and it seems highly probable that Epicurus himself presented just such a picture of universal concord arising from his theory of justice.

1025. bona magnaque pars: an unusual but not unique pleonasm (Costa ad loc.), cf. Terence *Eun.* 123: 'bonam magnamque partem ad te attulit' (cf. also Val. Max. 2.9.7). *Bona pars* should mean 'a great part' on its own, but there would seem little reason to agree with Marullus in his emendation *servabant*, keeping *casti* from OQ, and reading 'but a great and good part, the decent people (*casti*) kept the pacts', where he gives *bona* a moral weight. L. here, as throughout this passage, would be keen to avoid the idea of one part of the population, the morally superior, instructing the others, as in Posidonius fr. 284 E–K. His point here, surely, is that justice was easily obtainable (*parata*/*εὐπόριστος* in Epicurean terms, see on 1011) and that its rise and preservation did not depend on total agreement, but was a practical proposition if only the majority kept faith.

foedera: cf. *KΔ* 33: *συνθήκη*. The Latin word *foedus* has a much more formal and permanent feel than the Greek. *Foedus* works well for an unchanging and unchangeable 'law', cf. 5.923–4.

> sed res quaeque suo ritu procedit et omnes
> *foedere naturae certo* discrimina servant.

But here, perhaps, it works less well for the sort of flexible and temporary agreement Epicurus describes in *KΔ* 33 (see Schiesaro, 1990, 141). On the other hand, it could be that *nec laedere nec violari* is the one immutable element of an Epicurean friendship pact, and so the use of *foedera* could underline the permanence of this, the only true and fundamental justice.

1026–7. The apocalyptic implications of the failure of Epicurean justice are startling and seem, at first, unexplained. We can understand these lines in various ways.

Firstly, we could say that L. is carried away by his rhetoric and overstates his case for dramatic effect.

Secondly, according to D. J. Furley's analysis of L.'s method of argument (1978, 18; see on 1024), it can be seen that the destruction of the human race is necessary if L. is to prove by this method of argument that the friendship pacts must have been faithfully kept. That the human race has been destroyed is demonstrably untrue. If L. had merely said that the human race would have failed to thrive without Epicurean justice, it would not be demonstrably untrue, and so his case would not be proven within his own argument.

Thirdly, and more importantly, these two lines follow L.'s view of evolution. The Lucretian evolutionary model can be described as a pyramid. Many creatures were created in the beginning of the world (5.780–836) but *extinctions* have reduced their number and variety (5.837–77). Humans are not at the top of any evolutionary hierarchy but are simply another race of animals, and so subject to the same pressures of survival and dangers of extinction. For L. extinctions seem inevitable unless prevented by some particular ability (see above on 5.855 ff.). The striking similarity of 1027 and 856 indicates that L. is treating animal extinctions and human extinctions in the same way. For other animals abilities such as strength, cunning, and speed (863) have warded off extinction. For some animals it was their usefulness to humans that protected them (865–74). For humans it was their ability to co-operate, form friendship pacts, and pity the weak that were the particular abilities that enabled them to survive. Accordingly the previous behaviour of humans, their aggressive competitiveness, would have led not merely to psychological damage, as does the struggling for power and position in 1105–60, but to the complete extinction of the race (see further, introduction above).

§7 Lines 1028–1090: Origin of Language

The origin of language is an aspect of human evolution on which we have the opinions of Epicurus himself preserved at some length (*Ep. Hdt.* 75–6), and from the fact that Epicurus chooses it to exemplify his approach to the development of culture, the similar order of presentation in Diogenes of Oinoanda fr. 12 Smith, and the fact that we also have some other Epicurean sources for this topic, it would seem that this was one of the most important aspects of prehistory for the Epicureans. Further, fragments of Philodemus *De Pietate* (225–31, 510–60 Obbink) show that in book 12 of *Περὶ Φύσεως* Epicurus linked the development of language with the formation of the early human concept of the gods, and Philodemus himself derives injustice in his day from the prehistoric development of impiety. This urges the conclusion that the Epicureans saw the development of

[illegible]

language as closely involved with the development of both justice and piety, and of course their opposites (see Sedley, 1998, 121–2 and Obbink, 1996, 306, 349–66). A reconstruction of the Epicurean view of the place of language in the development of impiety and injustice is given in the Introduction, pp. 15–18.

This part of Lucretius' prehistory has generated probably a greater quantity of modern scholarship than any other, and there has been considerable argument on almost every aspect of the Epicurean theory of the origins of language. In particular, there is considerable disagreement on whether there is a direct relationship between things and their names in Epicureanism, and whether Epicurus' theory of the rightness of names and his theory of the development of language are closely related, as I maintain, or are quite separate ideas (see esp. Schrijvers, 1999, 55–7; Konstan, 1973, 44–58; L&S i. 100–1). The following is a selection of the most interesting and useful works, some of which take a fundamentally different approach from my own:

Asmis, 1996, 763–78; Baxter, 1992; Blickman, 1989, 166–78; Chilton, 1962, 159–67; Cole, 1990, 60–9; Dahlmann, 1928; De Lacy, 1939, 85–92; Elman et al., 1995; Everson, 1994, 75–107; Ferguson, 1987, 100–5; Giussani, 1896, ch. 12; Janko, 2000, 172–4 on Philodemus *On Poems* 1, cols. 115–17; Konstan, 1973, 44–58; Long, 1971, 114–33; L&S i. 88–90 and 100–1; Perelli, 1967, 202–22; Pigeaud, 1983, 122–44; Sedley, 1973; Schrijvers, 1999, 55–80 (= 1974*b*, 337–64); Spoerri, 1959; Vlastos, 1946.

Similarly, in modern anthropology the origins of language are the subject of considerable debate and speculation, sometimes along very similar lines to the ancient arguments, especially in focusing on gesture as the key to language development, or on instinctive animal sounds as proto-language. Despite two thousand years of investigation since Lucretius, it seems that no consensus has been reached, and the question is still wide open. As Parrot Hickerson says (2000, 3):

> Perhaps no subject has inspired more curiosity, speculation, and uncertainty as the origin of language. The uncertainty reflects the absence of solid evidence: we can never know exactly what early language was like, because speech is such an ephemeral thing. Archaeologists cannot unearth the remains of ancient words, as they can find potsherds or projectile points.

I have found the following modern studies very useful: Corballis, 1999, 138–45; Pinker, 1994, who argues for a traditionally Darwinian explanation by natural selection; and Parrott Hickerson, 2000, who gives a useful overview of modern theories and the history of their development.

We have already been given a glimpse of language developing at the same time as the first societies (1019–23), and seen its crucial importance both as the means by which societies were able to form and as a function or result of human interaction in the first gatherings of people. This close linking of language and the formation of society is also found in a non-Epicurean rationalist tradition represented by Diod. Sic. 1.8; Vitruv. *De Arch.* 2.1; Cic. *Rep.* 3.2.3, *De Off.* 1.4.12; Lactant. *Inst. Div.* 6.10.13. Cole (1990, 67–9) derives this tradition ultimately from Democritus, and sees the Epicurean theory as a modification of the Democritean, stressing the natural origins of language where Democritus stressed its origins by convention. This may be too simplistic an analysis, but it does seem that the two rationalist traditions existed side by side, and they are different in certain features, while they share others. It seems probable, however, that there was interaction between the two, and Lucretius' use of the language and themes found in the non-Epicurean rationalist tradition will be examined in the commentary below.

Epicurus in *Ep. Hdt.* 75–6 uses language to exemplify his approach to human development, epitomizing his (presumably) full treatment in the lost *Περὶ Φύσεως* book 12. In the extant fragments of *Περὶ Φύσεως* book 28 (ed. Sedley, 1973), Epicurus can be seen revising an earlier Epicurean approach to language theory, moving away from his own and Metrodorus' earlier stress on the role of *θέσις* in their formation of a technical vocabulary and towards the role of *φύσις*. It seems that Metrodorus especially had misunderstood Epicurus' theory that the things that underlie utterances must be used as reference points for truth, thinking that this meant that words should be used in their normal 'plain language' senses, and thus forged a technical vocabulary that imported words already attended by accretions of false meaning. (Sedley, 1998, 129ff., relying on the archon dates in the *subscriptiones* to *Περὶ Φύσεως*, considers that book 28 revises *Ep. Hdt.* 37–8, but I am assuming the latter gives the final result of Epicurus' and Metrodorus deliberations, and that

θέσις
φύσις

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θέσις
φύσις

Sedley's dating technique may be unconvincing, see Obbink, 1996, 351–2.)

Ep. Hdt. 75.1–76.7 (text L&S ii. 98):

Ἀλλὰ μὴν ὑποληπτέον καὶ τὴν φύσιν πολλὰ καὶ παντοῖα ὑπὸ αὐτῶν τῶν πραγμάτων διδαχθῆναί τε καὶ ἀναγκασθῆναι, τὸν δὲ λογισμὸν τὰ ὑπὸ ταύτης παρεγγυηθέντα ὕστερον ἐπακριβοῦν καὶ προσεξευρίσκειν ἐν μέν τισι θᾶττον, ἐν δέ τισι βραδύτερον καὶ ἐν μέν τισι περιόδοις καὶ χρόνοις ἀπὸ τῶν [ἀπὸ τοῦ ἀπείρου] ⟨ἰδίων χρειῶν κατὰ μείζους ἐπιδόσεις⟩ ἐν δέ τισι κατ' ἐλάττους. Ὅθεν καὶ τὰ ὀνόματα ἐξ ἀρχῆς μὴ θέσει γενέσθαι, ἀλλ' αὐτὰς τὰς φύσεις τῶν ἀνθρώπων καθ' ἕκαστα ἔθνη ἴδια πασχούσας πάθη καὶ ἴδια λαμβανούσας φαντάσματα ἰδίως τὸν ἀέρα ἐκπέμπειν στελλόμενον ὑφ' ἑκάστων τῶν παθῶν καὶ τῶν φαντασμάτων, ὡς ἂν ποτε καὶ ἡ παρὰ τοὺς τόπους τῶν ἐθνῶν διαφορὰ ᾖ· ὕστερον δὲ κοινῶς καθ' ἕκαστα ἔθνη τὰ ἴδια τεθῆναι πρὸς τὸ τὰς δηλώσεις ἧττον ἀμφιβόλους γενέσθαι ἀλλήλαις καὶ συντομωτέρως δηλουμένας· τινὰ δὲ καὶ οὐ συνορώμενα πράγματα εἰσφέροντας τοὺς συνειδότας παρεγγυῆσαί τινας φθόγγους· τοὺς ⟨μὲν οὖν⟩ ἀναγκασθέντας ἀναφωνῆσαι, τοὺς δὲ τῷ λογισμῷ ἑλομένους κατὰ τὴν πλείστην αἰτίαν οὕτως ἑρμηνεῦσαι.

We must take it that even nature was educated and constrained in many different ways by actual states of affairs, and that its lessons were later made more accurate, and augmented with new discoveries by reason—faster among some people, slower among others, and in some ages and eras, owing to [individual needs, by greater leaps], in others by smaller leaps. Thus, names too did not originally come into being by coining, but men's own natures underwent feelings and received impressions which varied peculiarly from tribe to tribe, and each of the individual feelings and impressions caused them to exhale breath peculiarly, according also to the racial differences from place to place. Later, particular coinings were made by consensus within the individual races, so as to make the designations less ambiguous and more concisely expressed. Also, the men who shared knowledge introduced certain unseen entities, and brought words for them into usage. [Hence some] men gave utterance under compulsion, and others chose words rationally, and it is thus, as far as the principal cause is concerned, that they achieved self-expression. (Trans. L&S)

Diogenes of Oinoanda also gives an account of the origins of language, which he presents as part of the general argument on the development of arts and technologies, fr. 12.II.11–V.14 Smith:

II καὶ τῶν
φθόνγων δὲ ἕνεκεν (λέ-
γω δὲ τῶν τε ὀνομάτων
καὶ τῶν ῥημάτων, ὧν

III ἐποιήσαντο τὰς πρώτας
ἀναφθένξεις οἱ ἀπὸ
γῆς θύντες ἄνθρωποι),
μήτε τὸν Ἑρμῆν παρα-
λαμβάνωμεν εἰς δι-
δασκαλίαν, ὥς φασίν
τινες (περιφανὴς γὰρ
αὕτη γε ἀδολεσχία),
μήτε τῶν φιλοσόφων
πιστεύωμεν τοῖς λέ-
γουσι κατὰ θέσιν καὶ
διδαχὴν ἐπιτεθῆναι
τὰ ὀνόματα τοῖς πράγ[μα]-
σιν, ἵν' αὐτῶν ἔχωσ[ι τὰ ἴδι]-

IV α τῆς πρὸς [ἀ]λλήλους ἕνε-
κα ῥᾳδίας ἀποδηλώσεως οἱ
ἄνθρωποι. γελοῖον γάρ
ἐστι μᾶλλον δὲ παν-
τὸς γελοίου γελοιότε-
ρον, πρὸς τῷ καὶ τὸ ἀ-
δύνατον αὐτῷ προσεῖ-
ηαι, σ[υνα]γαγειν μέν
τινα τὰ [το]σάδε πλήθη
ἕνα τυν[χά]νοντα (οὐδὲ
γάρ πω τότε βασιλέες ἦ-
σαν, οὐδὲ μὴν γράμμα-
τα ὅπου μηδὲ οἱ φθόν-
γοι· περὶ γὰρ τούτων καὶ

V ἀ[μήχανον ἂν ἦν, εἰ μὴ]
[διὰ] προσταγῆς, τὴν
συ[ῃ]αγωγὴν αυτῶν γε-
νέσθαι), συναγαγόντα
δὲ καθηγεῖσθαι γραμ-
ματιστοῦ τρόπον [κ]ερ-
κεῖδός τινος ἀν[τιλαβό]-
μενον, καὶ ἑκάστου τῶ[ν]
πραγμάτων θινγάνον-
τα ἐπιλέγειν ὅτι "του-

> τεὶ μὲν καλείδθω λί-
> [θ]ος, τουτεὶ δὲ ξύλον,
> [τ]ουτεὶ δὲ ἄνθρωπος
> ἢ κύων [ἢ] βοῦς"

And with regard to vocal sounds—I mean the words and phrases, of which the earth-born human beings produced the first utterance—, let us not introduce Hermes as teacher, as some claim he was (for this is palpable drivel), nor let us credit those philosophers who say that it was by deliberate invention and teaching that names were assigned to things in order that human beings might have [distinctive designations] for them to facilitate their communication with one another. It is absurd, indeed more absurd than any absurdity, as well as quite impossible, that any one individual should have assembled such vast multitudes (at that time there were as yet no kings, and indeed, in the absence of any vocal sounds, no writing; and with regard to these multitudes [it would have been quite impossible, except by means] of a decree, for their assembly to have taken place) and having assembled them, should have taken hold of a rod (? [κ]ερκεῖδός τινος) and proceeded to teach them like an elementary schoolmaster, touching this object and saying 'let this be called "stone", this "wood", this "human being" or "dog" [or] "ox"' (Trans. Smith)

Other Epicurean sources are Demetrius Lacon (P. Herc. 1012 col. 67) who is concerned with establishing Epicurean orthodoxy through textual criticism of Epicurus. He defends the Epicurean use of the term *φύσις* ('nature') and lists language as one of the things that arose *φύσει* ('by nature'), col. 67.4–5 (Puglia):

> |φύσει δὲ τας πρώτας τῶν | ὀνομάτων ἀναφωνήσεις γεγονέναι λέγομεν, καθὸ
> | [..]N[....]

We say that it was by nature that the first crying out of words arose in accordance with . . .

Celso

Origen *C. Celsum* 1.24.8–16 (= fr. 334 Us.) attacks the Epicurean theory, clearly linking the rightness of names and the origin of language in the Epicurean theory:

> ἐμπίπτει εἰς τὸ προκείμενον λόγος βαθὺς καὶ ἀπόρρητος, ὁ περὶ φύσεως ὀνομάτων· πότερον, ὡς οἴεται Ἀριστοτέλης, θέσει εἰσὶ τὰ ὀνόματα ἤ, ὡς νομίζουσιν οἱ ἀπὸ τῆς Στοᾶς, φύσει, μιμουμένων τῶν πρώτων φωνῶν τὰ πράγματα, καθ' ὧν τὰ ὀνόματα, καθὸ καὶ στοιχεῖά τινα τῆς ἐτυμολογίας εἰσάγουσιν, ἤ, ὡς διδάσκει Ἐπίκουρος, ἑτέρως ἢ ὡς οἴονται οἱ ἀπὸ τῆς Στοᾶς, φύσει ἐστὶ τὰ ὀνόματα, ἀπορρηξάντων τῶν πρώτων ἀνθρώπων τινὰς φωνὰς κατὰ τῶν πραγμάτων.

A profound and obscure question is raised by this subject, that concerning the nature of names. The problem is whether, as Aristotle thinks, names were given by arbitrary determination; or as the Stoics hold, by nature, the first utterances being imitations of the things described and becoming their names (in accordance with which they introduce certain etymological principles); or whether, as Epicurus teaches (his view not being the same as that held by the Stoics), names were given by nature, the first men having burst out with certain sounds descriptive of the objects. (Trans. Chadwick)

Proclus, the fifth-century AD commentator on Plato (*In Plat. Crat.* 17.5–17 = fr. 335 Us.), characterizes the φύσις theory given by Cratylus (Pl. *Crat.* 388e ff., see further below) as similar to that of Epicurus, and again clearly links the argument on the rightness of names with the origin of language:

ὁ γὰρ Ἐπίκουρος ἔλεγεν ὅτι οὐχὶ ἐπιστημόνως οὗτοι ἔθεντο τὰ ὀνόματα, ἀλλὰ φυσικῶς κινούμενοι ὡς οἱ βήσσοντες καὶ πταίροντες καὶ μυκώμενοι καὶ ὑλακτοῦντες καὶ στενάζοντες.

Epicurus said that they [the first humans] did not assign names to things by intelligence, but prompted by natural instinct, like coughing and sneezing, mooing and howling, and moaning.

Epicurus begins his account with a description of the universal process of learning applicable to the development of all human arts and technologies, and uses language as an explanatory example. He analyses the process of learning into two stages, firstly learning by direct interaction with nature, and then by the application of reason to things learned unreflectively. This analysis has been applied to Lucretius' prehistory, dividing it into two sections (see Manuwald, 1980, and my introduction to 925 ff., pp. 179–84).

In the *Letter to Herodotus*, after outlining the universal principle of learning in two stages, Epicurus signals briefly that he rejects the argument that names were originally imposed by arbitrary coining (θέσει) (*Ep. Hdt.* 75.6):

Ὅθεν καὶ τὰ ὀνόματα ἐξ ἀρχῆς μὴ θέσει γενέσθαι . . .

Thus, names too did not originally come into being by coining . . .

He then goes on to develop the argument 'by nature' (φύσει). The φύσις and θέσις arguments are presented as polar opposites in Pl. *Crat.* 388e–390e. Cratylus claims that names arise by nature, while Hermogenes argues that there is no natural relationship between things and their names, and that names arise solely by convention. Socrates produces a fusion of the two ideas in which names are given to things by a νομοθέτης but one who also ensures that they match the nature/φύσις of the thing, thus producing a name which acts as a brief descriptive catalogue of the thing's attributes. Democritus is also credited with a theory of the origin of names by θέσις (DK68 B26; Proclus *In Plat. Crat.* 16, p. 7. See Cole, 1990, 67–9) and gives four arguments against the φύσις theory: homonymy—the same name is used for different things, polynymy—some things have more than one name, [metonymy—transference of names between things], and anonymy—some things have no name (Bailey, 1947, 1489). Epicurus in Περὶ Φύσεως 12 criticized Prodicus, Diagoras, Critias, and Antisthenes for etymologizing aetiologies for the names of the gods, which indicates that they shared this view that originally names, even those of the gods, arose by convention (Phld. *De Piet.* 520 ff. with Obbink 358–9). Bailey (1947, 1489) notes that the θέσις argument appears together with the νομοθέτης only in the *Cratylus* and that therefore Lucretius (following Epicurus) is likely to be arguing against Plato rather than Democritus. Diogenes of Oinoanda's concentration on rebutting the νομοθέτης idea, rather than θέσις itself, would seem to confirm this. Given the Epicurean tendency to polemicize against Democritus (Kleve, 1978, 43 ff.; *DRN* 2.225 ff., 2.251 ff., 3.370 ff.; Diog. Laert. 10.24 Metrodorus' *Pros Democriton*), however, and Democritus' rival anti-teleological theory of the origin of language by θέσις we may be confident that Democritus is also a target.

It has often been claimed, however, that the argument in the *Cratylus* does not concern the origin of language but simply the correctness of names, and accordingly would not be the target of Epicurean polemics (see Baxter, 1992, 41–3; Robinson, 1969, 100–17). While it may be quite true that, for Plato, the origin of language and the correctness of names are quite different things, for Epicurus the notion of the natural link between names and things ensures that the two will be seen as part of the same process, and thus the *Cratylus* will be one of Epicurus' targets.

However, it can be seen that Diogenes of Oinoanda argues against a traditional divine νομοθέτης Hermes, and so mythical and religious notions will also be Epicurus' targets, as we should expect.

The φύσις theory, before Epicurus, referred only to the nature of the thing named and not to human nature as well, as Epicurus does, and claimed that there is some direct natural connection between the nature of the thing and its name (L&S i. 100–1). This is the argument of Cratylus (Proclus *In Plat. Crat.* 16; see Baxter, 1992, 3–4). Epicurus keeps the notion of a natural relationship between things and names, referring to both φαντάσματα and πάθη as causes of the production of vocal sounds. Thus πάθη would represent the feelings caused by interaction between the mind and the *simulacra* received from objects, and the φαντάσματα would represent the interactions between the sense organs and the *simulacra* themselves (Everson, 1994, 96, glosses φαντάσματα: 'affections of the senses which represent the world in a certain way'. Us. *Gloss.* 702). Thus, words are originally formed by a mechanistic process of the *simulacra* impinging upon the mind and causing the expulsion of a particular sound in response (Everson, 1994, 93 ff. sees the Epicurean theory as not simply mechanistic, but as also involving a psychological element in the process of the production of words). This closely relates to the Epicurean theory that there is a fundamental true meaning or primary notion that underlies each word and provides a πρόληψις or preconception of the thing itself (see *Ep. Hdt.* 37–8 with L&S i. 101 and 88–90), and the entire Epicurean approach to the investigation of nature based on the theory that all sense perceptions are true (L&S i. 83–6 and 88–90). The insistence on each word having a real primary meaning contrasts strongly with the Platonic and Stoic theories of the necessity for discovering the meaning of words by a dialectical process of argument, since these theories assume that meaning arises by convention (see L&S i. 101 and 193–5, and Everson, 1994, 78 ff.).

dialectical process

Epicurus, then, presents an advance on the previous φύσις theory, adding in the notion of an interaction between the thing named and human nature in producing names. Thus, he escapes Democritus' criticisms of the former φύσις theory by appealing to variations in human nature, according to geography and race, to account for variations in the names of things: the same *simulacra* will produce different responses from people with different physiological and psychological make-ups.

Having established the origin of names by this more sophisticated kind of *φύσις* theory, Epicurus goes on to further refine his account by allowing some place in it for a version of the *θέσις* theory. In this, at a later stage, a vocabulary was decided on by agreement to enable clearer communication. This does not, however, exactly parallel the theory of names imposed entirely by convention, since each person will already have their own names for things produced by nature. These may not be entirely the same for each person since each person's physiological make-up will be slightly different, and so mutual agreement on choice of vocabulary will be necessary, and we may see a process of honing of these, presumably rough-hewn, names to produce greater clarity. Accordingly, this process of *θέσις* will be one of choosing between naturally arising names, and of one person adopting the vocabulary of another to facilitate communication between them, rather than of the arbitrary choice of names that bear no relation to the object. Accordingly, names will have a much closer natural relationship to things than they do in Socrates' theory in the *Cratylus* where names act simply as descriptive labels for things. The *νομοθέτης*, and any idea of imposition of meanings by compulsion, is implicitly rejected by the mutuality of the process of *θέσις* and the division of the task among many people.

Thus, Epicurus accounts for both the origins of words (the names of things), and the origins of language (communication using words). The first stage is one in which words are produced by the interaction of people directly with their environment, and communication is achieved in a later second stage in which reason applied to words produces mutual agreement on the meanings of words and thus produces language.

The third stage is one in which names are invented for abstract entities by intellectuals. This process is presumably entirely one of *θέσις*, and it is here especially that false opinion may creep into language.

Lucretius' presentation of the origin of language concentrates mainly on the natural origins of language. He stresses a sense of 'natural' different from Epicurus' in the *Letter to Herodotus*: that language is in some way innate in humans, and argues against the rival theory that words originally arose by arbitrary imposition (θέσις) by a 'law-giver' (νομοθέτης) (1041–55), an argument that Epicurus does not explicitly rebut in the *Letter to Herodotus*. He explains the origin of language in two lines (1028–9), this is then proved by the appeal to the instinctive behaviour of children and animals, and this appeal in turn proves his anti-νομοθέτης polemic. The Epicurean sense of 'natural' found in *Ep. Hdt.* 75–6, the production of words by an interaction between things and human feelings, is introduced at 1056–8 and is followed by appeals to animal vocal abilities, which are claimed to prove it. Epicurus' second stage of the clarifying of vocabulary by mutual θέσις is represented only by the ambiguous reference to the function of *utilitas* in 1029 (see further below), and the third stage of the invention of abstract terms by θέσις is omitted altogether.

①

'natural' in the interaction between things and human feelings

A similar simplification of Epicurus' treatment is also found in the later Epicurean Diogenes of Oinoanda fr. 12 Smith. He simplifies further, and concentrates exclusively on arguing against an original νομοθέτης, explaining the origin of language only as part of the general approach to all arts and technologies, which developed by necessity and experience in conjunction with time, and omits any mention of the natural origins of language (see further below on 1041 ff.). Lucretius differs from Diogenes in the manner of his refutation of the νομοθέτης, and also in his use of biological analogies. Neither the anti-νομοθέτης polemic nor the use of biological analogies is found in the extant works of Epicurus. This is not to say that neither of these is Epicurean (see below on 1030 ff.), and it seems unlikely that Lucretius and Diogenes have diverged significantly from Epicurus by the introduction of radically different argumentation. We may presume that *On Nature* 12 contained a range of arguments from which later Epicureans, and indeed Epicurus himself in the *Letter to Herodotus*, could select the most useful.

The Epicurean theory of the 'natural' origin of names is brilliantly satirized by Flann O'Brien in *The Third Policeman* (pp. 35–6 n. 3), where he puts it forward as a theory of the fictitious eccentric sage de Selby:

> De Selby (*Golden Hours*, p 93 *et seq*) has put forward an interesting theory on names. Going back to primitive times, he regards the earliest names as crude onomatopoeic associations with the appearance of the

of Laconia, and L., while the anti-Epicurean Origen, on the other hand, does explicitly link names and things.

A similar technique may be seen in L.'s use of *varios linguae sonitus*, another problematic phrase. Again, as with *natura*, we should expect this to have an Epicurean meaning as 'words', no matter how roughly formed, that have some relationship with things. This would be confirmed by L.'s use of this same phrase to describe the linguistic ability of the putative νομοθέτης (1043–4) where it is clear from 'cuncta notare | vocibus et varios sonitus emittere linguae' that this is a complete language capability. However, L.'s use of similar phrases for the wordless cries of animals (1060, 1088) would suggest that these *sonitus* here are much the same as the unformed noises uttered by Vitruvius', Diodorus', and Cicero's first humans (see Cole, 1990, 60–1 for this view). The presentation of a seeming two-stage process with nature forcing out the *linguae sonitus* and *then utilitas* forming them into names would also give this impression, with *linguae sonitus* and *nomina rerum* being opposed. This seemingly contradictory use of language by L. may be explained with reference to the closeness of the ideas of *linguae sonitus* and *nomina rerum* in Epicurean thinking, compared to their status as fundamentally different things in the rival tradition. According to *Ep. Hdt.* 75–6 *linguae sonitus* will actually be *nomina rerum*, if only in a rough form, which will be honed and refined over time. Thus, L.'s presentation is acceptable to both traditions, and the opposition between *linguae sonitus* and *nomina rerum* will be more that of words and language. The first solitary humans will utter words but these will only become language in a process of mutual interaction in the first societies.

Utilitas with its suggestion of both use and usefulness again gives the impression that the process is essentially similar to that in Vitruv. *De Arch.* 2.1. Vitruvius places the role of *utilitas* in a slightly earlier stage than L., but allies it to the idea of gesture as L. does. People notice that the warmth of fire is pleasant and so:

> alios adducebant et *nutu monstrantes* ostendebant quas haberent ex eo *utilitates*

After this, random sounds are formed into words by a process of daily use involving some notion of the use of things:

in eo hominum congressu cum profundebantur *aliter spiritu voces, cotidiana consuetudine* vocabula ut obtigerant constituerunt, deinde significando *res saepius in usu* ex eventu fari fortuito coeperunt et ita sermones inter se procreaverunt.

This outline is essentially one of θέσις where words have no direct relationship with things, and where φύσις is limited to the human ability to produce random sounds. Accordingly it is not Epicurean, but L.'s presentation in 1028–9 could very easily be taken as a similar outline. Thus, again L. can be seen appropriating a rival theory for his own purposes.

The notion of *utilitas* as a factor in the development of *artes* is seen in the explanation of the discovery of the use of metals at 1255, where the πρόληψις for smelting and casting metals is provided by molten metal running into hollows in the ground. There the need for the application of reason is, at least, reduced by the provision of the πρόληψις that allows the extrapolation of the possible use of metals with the minimum of conscious thought. Here in language the need for reason is further reduced since words will have a close correspondence with things, and so a ready-made πρόληψις of the meaning of a word is provided. The unreflective use of things, then, will lead to a notion of the usefulness of words arising irrationally along with the use of the thing, and the ideas of *usus* and *utilitas* will be essentially the same. Vitruvius presents a similar process in his non-Epicurean explanation where the utility of fire is felt directly (its warmth on the body) and then that utility may be communicated to others directly by sign language. Neither in L. nor in Vitruvius is reason involved in the process. Diogenes of Oinoanda's explanation for the development of all arts and technologies as the products of needs and experience in conjunction with time also serves to explain the origins of language, and this also seems to be an entirely irrational process.

1030–2. **non alia longe ratione . . . praesentia monstrent:** having lost their original state of childish dependence in 925–1010, L.'s first humans now regain something of their childishness in these analogies with children and young animals.

To explain the previous two lines and the functions of *natura* and *utilitas* L. appeals to the use of gesture as a form of proto-language. Again we see little of the outline found in *Ep. Hdt.* 75–6, and L.'s account comes close to the Vitruvian/Diodoran tradition where gesture as a proto-language is also found. Diod. Sic. 1.8:

> καὶ πολεμουμένος μὲν ὑπὸ τῶν θηρίων ἀλλήλοις βοηθεῖν ὑπὸ τοῦ συμφέροντος διδασκομένους, ἀθροιζομένους δὲ διὰ τὸν φόβον ἐπιγινώσκειν ἐκ τοῦ κατὰ μικρὸν τοὺς αλλήλων τύπους.

When they were attacked by wild beasts they, taught by self-interest, came to one another's aid; and after they had thus been led by fear to gather into groups, they presently *came to understand the signs they made to one another*. (Trans. L&B)

Vitruv. *De Arch.* 2.1:

> ligna adicientes et ita conservantes alios adducebant et *nutu monstrantes* ostendebant quas haberent ex eo utilitates.

Cicero in Lactant. *Div. Inst.* 6.10.13 ff. gives an outline of a seemingly Epicurean theory, which includes gesture:

> admonitos periculi sui ad alios homines decucurisse, praesidium implorasse et primo *nutibus* voluntatem suam significasse

Vitruvius, Diodorus, and Lactantius all have gesture as the first language, all in the context of mutual aid, and the latter two in the context of a struggle for survival against wild beasts. The idea that the origin of the first societies lay in the necessity for protection against wild animals, found in Diodorus and Lactantius, is also found in Epicurus' successor Hermarchus (fr. 34 LA), but his views on the origin of language are not reported. It is not clear whether the Lactantius passage conflates the Epicurean and Vitruvian/Diodoran traditions, both of which would equally be open to the writer's criticism that the first societies developed not through self-interest but through the Stoic theory of inherent social instinct, or whether another Epicurean source is being followed. Perhaps tellingly, L. explicitly attributes gesture to the first humans, also in the context of mutual aid in the quest for security, but in the slightly different context of people gaining protection against each other rather than against wild beasts, cf. 1022: 'vocibus et *gestu* cum *balbe* significarent'. Thus, L. also posits gesture as the first language, and at the same, or a similar, point in the development of the first societies as in

Vitruvius, Diodorus, and Lactantius. In the context of L.'s association between gesture as a proto-language and animal 'language', it may be interesting to compare the *Kunokephaloi* of Ctesias *Indica* 20, who 'bark and signal with their hands and fingers, as do mutes'.

Here at 1030–2, however, the appeal is to gesture used by modern-day children rather than to prehistoric adults. Fundamentally the analogy is the same: the appeal to nature as an uncorrupted state in order to view humanity without the obscuring accretions of culture (see L&B 103 ff. for the history of the technique. Schrijvers, 1999, 81–2 notes the use in modern anthropology of the concept of child behaviour and that of 'primitive' peoples as analogous). However, L.'s appeal to gesture here is more complicated than Vitruvius', Diodorus', and Lactantius', who would say simply: 'the first people used gesture as their first language, and then the sounds they uttered naturally came to stand as symbols for things and emotions, as gestures had done, and so gradually spoken language took over from gestural language'. He is comparing the origin of language as *gesture* in children with the origin of *spoken language* in prehistoric people. Thus, we have a double analogy: both—the process of the development of the first language is analogous to the process of language development in children, and—spoken language is analogous to gestural language. This adds the further complication that the analogy is both diachronic and synchronic.

Thus, we are given a multiple correspondence analogy, one that may set off various associations in our minds, but in which it is very difficult to pin down one exact meaning. We are left with the impression that in some way spoken language is 'natural', as it is in children and was in the first people, that it is closely analogous to gesture both in children and the gestures of the first people, and that its original development is connected in some way with a child's interest in and notion of the use or usefulness of the things around her.

1030. non alia longe ratione: L. indicates that the analogy is not exact, and, considering its possible permutations, it is natural that L. should shy away from claiming a direct analogy between prehistoric spoken language and modern child gesture.

1031. infantia linguae: in the context of an explanation of the origins of *spoken* language, this analogy with a child's inability to speak may seem perverse, but the main force of it seems be that even children who cannot speak feel impelled to use *some sort* of language, and so it is less surprising that the first humans, who had the full complement of vocal abilities (1056–8), were able to use their voices as a form of language, no matter how crude. This technique is taken a stage further in the following section (1033–40) where an analogy is drawn with *non-linguistic* instinctive animal behaviour. Thus, the analogy suggests that the process of language development is partly evolutionary and partly not: the child gains full vocal abilities gradually, while the first humans were born with them, and so there is no idea of physical evolution presented here. On the other hand, the learning of vocabulary by a child and the forging of vocabulary by the first humans may be seen as parallel evolutionary processes.

1032. cum facit ut digito quae sint praesentia monstrent: this may seem a surprisingly limited reference to gestural language, omitting the range of functions that gesture has in the present day and had presumably during the past, and concentrating only on gesture as indication. Vitruvius, Diodorus, and Lactantius all have much more sophisticated communication using gesture, and we have seen L.'s first villagers using gesture in a very advanced argument at 1021–3. However, in the analogy with infant gesture, L. must limit himself to only those gestures observable in infants, and this may rule out any others than indicatory gestures.

This sort of gesture would correspond to a first stage of gesture, conjectured by modern anthropologists, as merely indicatory, about 6–7 million years ago shortly after the divergence of our line from that of the great apes, e.g. 'there is an antelope'. This would be followed by hand signals conveying more information, perhaps by *Australopithecus* *c.*5 million years ago, e.g. 'there is an antelope, keep quiet'. Then followed by fully syntactical gestures along with vocalization by early *Homo* *c.*2 million years ago, e.g. 'there is an antelope, I'm hungry, so keep quiet', and finally the dominance of vocal language *c.*100,000 years ago by early *Homo sapiens* (from Corballis, 1999, 138–45).

Of course, although these associations with prehistoric gestural language are present, L.'s main argument is that *spoken language* was innate in early humans as gestural language is in modern infants, and so there is no real need for him to draw a clear analogy between infant gestures and prehistoric human gestures.

Lines 1033–1040

This section of biological analogies both continues as a further explanation of the origins of language, and leads into the anti-νομοθέτης argument. L. goes a stage further in the appeal to nature than in 1030–2 and the analogy with infant gesture. Here the analogies are with young animals, and spoken language in humans is compared to *non-linguistic* behaviour in animals. Clearly, since none of the animal behaviours he mentions are linguistic, L. is primarily concerned to establish in this section that certain behaviours are innate in animals, and that this makes it even more likely that language was in some way innate for humans (i.e. an a fortiori argument). Thus, the argument is somewhat different here than in 1056 ff. where human language ability is explicitly compared to animal vocal ability.

The analogy with the development of the faculties of young animals is problematic, however, since L.'s first humans must be imagined to have arisen fully provided with the physical equipment necessary for vocal production while the young animals are presented as lacking physical attributes, and so the analogy seems a loose one. The stress is laid on the innateness of behaviours *before* the development of the physiology necessary for their full expression, and so, notoriously, a conflict arises here between L.'s seeming claim that language is innate in humans and the claim at 4.823 ff. that organs and limbs must pre-exist their functions (see L&S i. 64–5; cf. Gale, 2000, 92–3). L&S explain that if we allow the Epicureans an evolutionary theory based on the inheritance of acquired characters (as I do, see on 1011–27 above), we may imagine that the first creatures would be born without instincts to use their faculties, but that their offspring may inherit such instincts from their parents who developed them from the use of the organs and limbs. This would get round the problem of how the calf is born with an instinct to butt: the first cows were not, but their descendants have inherited behaviours as instincts that their parents learned, but this cannot make the analogy exact between the first humans' innate possession of language and the instincts of a modern creature. While we may have inherited a language instinct, the first humans have not, yet language is presented as if innate.

Another explanation may lie in L.'s use of *sentire*: some of the teleological implications of these lines arise from the fact that at 4.823 ff., L. appropriates the arguments of teleologists and recontextualizes them (see Schrijvers, 1999, 75–8; Cic. *ND* 2.127 with Pease ad loc., who lists examples; Galen *Cyrop*. 2.3.9; Hierocles 1.34–9, 51–7, and 2.1–9 (= L&S 57C)). Galen (*De Us. Part*. 1.3), in support of the theory of natural teleology, i.e. that there is a final cause in nature that provides each animal with its distinctive faculties and instincts in order to allow it to survive, gives a traditional list of such instinctive faculties, and sums up:

> *αἴσθησιν γὰρ πᾶν ζῷον ἀδίδακτον ἔχει τῶν τε τῆς ἑαυτοῦ ψυχῆς δυνάμεων καὶ τῶν ἐν τοῖς μορίοις ὑπεροχῶν·*
>
> Each living creature has a perception of the capabilites of its inner nature and of the powers in its limbs.

This corresponds closely to 'sentit enim vis quisque suas quoad possit abuti', but whereas Galen means that each creature has a pre-existing instinctive sense of its own faculties, L. must mean something subtly different. Schrijvers explains that the key difference lies in Galen's use of *αἴσθησις* and L.'s use of *sentit* (see Schrijvers, 1999, 76 n. 70 and Solmsen, 1961 for different uses of *sensus* and *αἴσθησις*). Galen refers to an internal feeling of a creature for its abilities, while L. refers to an externally gathered sense of its abilities arising from the experience of using them. Thus, 'sentit enim vis quisque quoad possit abuti' would explain instinctive behaviour as a process of experiment that involves no real prior innate urge to use an organ for a particular purpose, but the possession of that organ will lead to its use, and this will provide a notion of the *utilitas* to which that organ may be put. This in turn will encourage the use of that organ and so lead to a further increase in knowledge of its potential, and so to further use. This agrees well with the combination of the two ideas of 'use' and 'usefulness' in *utilitas* at 1029, since each gives rise to the other. Thus, originally the first humans would have no innate language instinct, but would very soon discover that they had all the right equipment to make sounds, and would explore the range of vocalizations they possessed. Accordingly, on the one hand they were created with an *innate potential language ability* in that they had from the first the correct physiology for language, but on the other hand they had no real instinct for language, but would, in exploring their abilities, behave very much as if they had.

1036. catuli pantherarum scymnique leonum: *scymni* occurs only here in Latin (Sedley, 1998, 56). As Sedley notes, the introduction of the foreign panthers and lions following the homely Italian bucolic picture of the butting calf, and the Greek word *scymni* for 'cubs', placed alongside the normal Latin term *catuli*, has the effect of emphasizing that instinctive behaviour is universal, and so also emphasizing that an innate human language potential was universal, differing as it does in vocabulary according to geography.

1037–8. unguibus ac pedibus . . . unguesque creati: L. uses the scene of young animals play-fighting at 1068 'aut ubi eos iactant pedibus morsuque petentes' where the argument is on the variety of sounds produced by animals according to mood. And at 1082 'et cum de victu certant praedaeque repugnant' he uses similar language of real fighting between sea birds for the same argument. The analogy is somewhat different from the butting calf since at least the cubs are born with teeth and claws, if undeveloped ones, and so fit the analysis of 'instinctive' behaviour as the interaction between 'use' and 'usefulness' outlined above much better.

1039–40. alituum porro . . . petere auxiliatum: this analogy is not specifically with the behaviour of young birds but of birds universally, and so edges towards the type of analogies from 1059 ff. with adult animal behaviour. The difference is, of course, that here we are still in the general argument on the innateness of behaviour, rather than the later argument on animal vocal ability as analogous to human vocal ability.

1039. alituum . . . genus: see above on 5.801, cf. 5.1078 and 6.1216.

Lines 1041–1055

The heart of L.'s argument on the origin of language is this anti-νομοθέτης polemic. The preceding analogies serve to explain 1028–9, but also provide the basis for the rebuttal of the idea that language had one first-discoverer, who then taught it to others. This idea comes in two main forms, and the νομοθέτης may be divine or human. Either of these would be anathema to the Epicureans: the divine teacher because of the Epicurean insistence on the apathy of the gods, and the human teacher both because he is likely to be considered divinely inspired, and because the first-teacher model is in fundamental disagreement with the Epicurean idea of gradualism and mutuality in the development of the arts and technologies. The idea of the νομοθέτης is closely linked to the heurematist tradition of the development of *artes*. In this each *ars* is ascribed to a first discoverer, who is divine in the early tradition, and so the concept is teleological, but in the later tradition to an outstanding human, and so the concept tends to become anti-teleological. Divine and human first discoverers are found together, however, in heurematist lists such as that of Pliny *NH* 7.57 (see Gale, 1994, 75–80; L&B 382 ff.; Kleingünther, 1933, *Πρῶτος Ἑυρετής*) and so it seems that divine and human first discoverers are not mutually exclusive concepts. Further, outstanding humans as first discoverers are also found in teleological contexts (Seneca *Ep.* 90, Posidonius fr. 284 E–K). The idea of language and technology as divine gifts is very strong throughout antiquity (see Appendix B s.v. 'Discoveries and Inventions: Granted Divinely'), and is still popular; witness the *deus ex machina/nomothetes* theory of the origins of culture in *2001 A Space Odyssey*.

Behind this anti-νομοθέτης argument lies the ancient antithesis between φύσις and νόμος in their roles in the development of culture in Greek thinking (see L&B 103 ff.). νόμος in this sense tends to come to mean 'convention' or 'custom' as well as 'law', and so comes close, in theories of language, to the idea of θέσις, according to which names arose by convention. In the νομοθέτης context the idea of νόμος has much of its force as 'law' since the primary function of the νομοθέτης is to impose laws as well as language. In this way, language is again seen to be tied in closely with the origins of justice: for the Epicureans, as we have seen, language arises naturally, and allows the formation of the first societies and the consensual founding of mutually altruistic friendship pacts, while for teleologists language must be imposed from above in the same way as law, for the benefit of humans, but without regard to their will. Accordingly, the νομοθέτης theory of the origins of language carries with it an entire political theory of coercive societal control by restrictive legislation, which makes it even more crucial for the Epicureans to attack it (see further below on 1050–1, and Appendix B). A parallel example may be seen in the cosmology of the Maidu people of California (Parrot Hickerson, 2000, 5):

> Kuksu [the first man] called all the people together . . . He told them each the names of the different animals . . . in their languages, taught them how to cook and hunt, gave them their laws, and set the time for all their dances and festivals.

Kuksu then is a classic νομοθέτης who imparts language, law, and all culture.

Diogenes of Oinoanda (fr. 12 Smith) also sees it as his central task to rebut the νομοθέτης theory, and this seems to be the focus of his approach to the development of the arts and technologies generally. He explicitly denies that the arts were a gift of the gods, explaining that they developed gradually by human ingenuity. The divine νομοθέτης Hermes (giver of language in Diodorus 1.16.1; of fire in *Hom. Hymn Herm.* 3; and of justice in Pl. *Prt.* 320c ff.; Gale, 1994, 179) is simply rejected out of hand, but the idea of a human νομοθέτης is shown to be a practical impossibility on the grounds that without language he would not have been able to gather a large group of people together to teach them, while the idea of the νομοθέτης instructing people as a schoolmaster and giving arbitrary names to things is rejected as absurd.

1041. proinde: the anti-νομοθέτης argument is introduced as if following on from the preceding analogies. Presumably the argument runs: 'language was originally innate in humans as is shown by similar innate behaviour in animals, and so it is stupid to think that . . .'.

1041–3. proinde putare . . . desiperest: the aggressive character of the dismissal of the νομοθέτης is characteristically Epicurean (see Kleve, 1978), as shown by Diogenes of Oinoanda fr. 12.III.4–IV.10 Smith:

> μήτε τὸν Ἑρμῆν παραλαμβάνωμεν εἰς διδασκαλίαν, ὥς φασίν τινες (περιφανὴς γὰρ αὕτη γε ἀδολεσχία) . . . γελοῖον γάρ ἐστι μᾶλλον δὲ παντὸς γελοίου γελοιότερον, πρὸς τῷ καὶ τὸ ἀδύνατον αὐτῷ προσεῖη̣αι, σ[υνα]γαγειν μέν τινα τὰ [το]σάδε πλήθη ἕνα τυν[χά]νοντα . . .

> let us not adopt Hermes as our teacher, as some say he was: that *is palpable drivel* . . . for it *is absurd, indeed absurder than any absurdity, not to mention impossible*, that someone should all on his own have assembled all those multitudes . . . (Trans. Smith)

1043–5. nam cur hic posset . . . non quisse putentur? An excellent argument against a human νομοθέτης: how could just one person have a language ability if all others lacked it? The Epicurean view would be determined by the doctrine of *isonomia*, which states that we must assume that physical laws are universally the same. In the investigation of unknowable things, such as prehistory, this would act diachronically, and lead to the conclusion that, since we have a language ability today, it must have been possessed by our ancestors. This doctrine is used to prove the infinite number of worlds in 2.1077 ff. (see L&S i. 57–65). The argument may be less effective against a divine or divinely inspired νομοθέτης, however, since he could be granted his ability individually. Plato has Protagoras go out of his way to argue that although culture was granted divinely by Hermes (*Prt.* 320c ff.), it was granted deliberately to all humans at the same time, rather than to a few individuals. This may indicate that Plato is fully aware of the teleological implications of the νομοθέτης model, and shows how the alternative argument, the possession of culture simultaneously by all people, may be appropriated and used in a teleological way.

This question is similar to a central problem in modern theories of the evolution of language: how can language have evolved in the classic Darwinian mode with the acquisition of a greater and greater language ability by small increments, since the possession of language ability by one person to a greater degree than others cannot have possibly been an adaptive advantage, since no greater communication between them would result? (See Pinker, 1994, ch. 11.)

cuncta notare | *vocibus* and *varios sonitus . . . linguae* seem to be presented as the same notion, and describe a complete linguistic ability (see note to 1028–9 above).

1046–9. praeterea si non alii . . . sciret animoque videret? L. stresses that a *notities* or πρόληψις for the usefulness of language is necessary for its development. The argument is that, if only one person, the νομοθέτης, had a vocal ability, this would not have developed into language proper, since he could have had no idea of how this vocal ability could be used without hearing other people using sounds as communication. The argument may appear to be somewhat circular: for language to have developed it was necessary for people to be already communicating with language. However, we should remember that this is part of L.'s disproof of an impossible idea and so the situation described is also impossible. In truth there was no real beginning of language, at least in the sense that there was no first discoverer of language: the first humans would produce sounds as soon as they arose from the earth, according to their emotions and interaction with their environment. These sounds, because they would be similar to those produced by a listener, would therefore carry with them an idea of their meaning, and thus a notion of the use to which they could be put in communication. This idea of a *notities* of usefulness of something arising from its use is essentially the same as at 4.823 ff., where we are told that it is use that creates a *notitiam utilitatis* (4.854. See note to 1028–9) of organs such as the eyes, tongue, limbs, etc. (see L&S i. 88–9).

Again the argument may seem more effective against a putative human νομοθέτης than a divine one. The divine νομοθέτης would, however, be subject to the same criticism as the divine creators of the world in 5.181–5:

> exemplum porro gignundis rebus et ipsa
> notities hominum divis unde insita primum est,
> quid vellet facere ut scirent animoque viderent,
>
> . . . .
>
> si non ipsa dedit specimen natura creandi?

Clearly, there, the argument is anti-Timaean (*Tim.* 30 ff.; see Solmsen, 1951, 1–23; De Lacy, 1983, 297), or rather, repeats an argument to which Plato is responding in his expedient of having the Demiurge first create a model of the world which he then copies. Here the argument may be seen either as specifically anti-Platonic, or as generally anti-teleological.

1050–5. The practical impossibility of the *νομοθέτης* teaching names to other people is also used by Diogenes of Oinoanda in fr. 12 Smith (see above). L. stresses that one person alone could not practically have forced others to learn, that it is difficult to teach deaf people, and that they would not have put up with the, to them, meaningless noise of the instruction of the *νομοθέτης*. Diogenes' approach is slightly different in that he points out the impossibility of gathering enough people together without language with which to do it, and without the coercive authority of kings. He leaves out the better argument of L. that language cannot be taught without the medium of language, and so the explanations of the *νομοθέτης* would themselves be meaningless. Diogenes hints, perhaps unconsciously, at a rejoinder to this argument in his picture of the *νομοθέτης* gesturing with a stick (the text is doubtful here, see Smith ad loc.): the medium of instruction would, of course, have to be gestural language, and the method could well have been successful, even in teaching those with no former notion of language, as the case of Helen Keller demonstrates.

The problem of accounting for the first gatherings of people in which language could develop was clearly a live one, since Diodorus 1.8, Vitruvius 2.1, and Lactantius *Div. Inst.* 6.10.13–15 feel obliged to give reasons for the origins of the first gatherings: Vitruvius arguing for the warmth of fire attracting a crowd of people, Diodorus and Lactantius for the attacks of wild beasts driving people together for protection.

1050–1. cogere item . . . nomina vellent: the violence of the language in *cogere*, *victosque*, and *domare* reminds us of the political context of the anti-*νομοθέτης* argument, since laws as well as language are often imposed by a *νομοθέτης*. In this way, the idea of a language *νομοθέτης* and his controlling restrictive function, forcing, defeating, and taming people, approaches that of the *νομοθέτης* as giver of laws as found in Pl. *Prt.* 320c ff., where Hermes, on the orders of Zeus, grants culture and technology to humans, and also imposes justice on pain of death for transgressors. As a contrast to this, L., with *vellent*, stresses the consensual nature of the Epicurean theory, in which vocabulary is established by mutual consent rather than coercive imposition by a νομοθέτης. Diogenes also brings out this coercive nature of the νομοθέτης, with the rod suggesting the ambiguity implicit in a schoolmaster's cane as either a mere indicator or an instrument of punitive violence, and his claim that the authority of kings would have been necessary to force people together also reminds us of the political context (see also above, introduction to 1041 ff.). Compare Hermarchus' insistence that justice did not arise by force, fr. 34 LA (reported by Porph. *De Abst.* 1.7.1–9.4 = L&S 22M):

οὐδὲν γὰρ ἐξ ἀρχῆς Βιαίως κατέστη νόμινον οὔτε μετὰ γραφῆς οὔτε ἄνευ γραφῆς τῶν διαμενόντων νῦν καὶ διαδίδοσθαι πεφυκότων, ἀλλὰ συγχωρησάντων αὐτῷ καὶ τῶν χρησαμένων.

Originally, no law, whether written or unwritten, among those that persist today and are naturally transmitted, was established by force, but only by agreement of the users themselves. (Trans. L&S)

The contrast between a νομοθέτης as a schoolmaster and time as a teacher is found in a fourth-century fragment of the comic poet Philemon (Stob. *Ecl.* 1.8.34, in Meineke *Com. Graec.* 4.54):

ὅσαι τέχναι γεγόνασι, ταύτας, ὦ Λάχης,
πάσας ἐδίδαξεν ὁ χρόνος, οὐχ ὁ διδάσκαλος.

Whatsoever arts have come to be, all these Laches,
have been taught by time not by the school-master.
(Trans. L&B)

Moschion *TrGF* 1.97 fr. 6 gives four alternative explanations for the development of culture: 'time', 'Prometheus', 'necessity', or 'long practice making nature herself their teacher'. 'Nature', 'time', or 'necessity', as teacher of culture, later became a commonplace, as in Diod. Sic. 1.8.9.1–5:

καθόλου γὰρ πάντων τὴν χρείαν αὐτὴν διδάσκαλον γενέσθαι τοῖς ἀνθρώποις, ὑφηγουμένην οἰκείως τὴν ἑκάστου μάθησιν εὐφυεῖ ζῴῳ καὶ συνεργοὺς ἔχοντι πρὸς ἅπαντα χεῖρας καὶ λόγον καὶ ψυχῆς ἀγχίνοιαν.

Indeed, speaking generally, in all things it was necessity that became man's teacher, supplying in appropriate fashion instruction in every matter to a creature which was well endowed by nature, and had as its assistants for every purpose, hands and speech and sagacity of mind. (Trans. Oldfather)

1051. perdiscere: this stresses the enormity of the task of memorizing all the names of things, and so further helps to undermine the *νομοθέτης* theory.

Lines 1056–1090

The earlier appeals to animal behaviour (1034–40) intend to prove only that certain behaviours are innate, and do not claim that animals have any linguistic ability or language. Now L. appeals to the *vocal* abilities of animals. He does not quite claim that animals have language, but he comes close in his examples to presenting animals communicating with one another. Again, as in 1034–40, the analogy between human and animal behaviour is not exact, and L. claims only that animal vocal variation according to mood makes it *even more likely* (1089–90) that originally humans were able to relate words to things according to different sensations (i.e. an a fortiori argument).

1056–62. The two abilities of humans and animals here compared in the proposition: an instinctive animal ability to produce different vocalizations according to mood, and an instinctive human ability to relate words to things according to feelings, may seem to be fundamentally different to us, but in the Epicurean theory they are closely related. 'Pro vario sensu varia res voce notaret' corresponds closely to Epicurus': 'men's own natures underwent feelings (*πάθη* = *sensus*. See also note to 1058 below) and received impressions (*φαντάσματα*) which varied peculiarly from tribe to tribe, and each of the individual feelings and impressions caused them to exhale breath peculiarly, according also to the racial differences from place to place' in *Ep. Hdt.* 75. There, different sounds are produced according to the different *πάθη* caused by different *φαντάσματα* received from different objects. L. *presents* the process in reverse, with different feelings expressing sounds which then denote different objects, but of course the process is a circular one in which the explanation of the relationship of sounds to things and of things to sounds is the same, but may be described from either point of view. Accordingly, the production of different sounds according to different feelings by animals is close to the production of different sounds which denote things, according to different feelings, by humans, since the human feelings are caused by an interaction with things and thus those sounds will have a direct relationship with the things they denote. The main difference is that, although animals vocalize according to their emotions, these do not seem to be affected by objects in such a way as to cause the production of *words*, but only of *sounds*. We may presume the mechanism of the process is the same for humans and animals, but the animals' lack of the physical equipment for speech prevents proper words being produced, and so they do not produce words as such but only sounds. These sounds, however, may be assumed to represent an interaction between animals and their environment, which although not real words, are analogous to words.

Proclus *In Plat. Crat.* 17 (= fr. 335 Us.), comparing Epicurus' theory with that of Cratylus, also uses analogy with animal cries:

> ὁ γὰρ Ἐπίκουρος ἔλεγεν ὅτι οὐχὶ ἐπιστημόνως οὗτοι ἔθεντο τὰ ὀνόματα, ἀλλὰ φυσικῶς κινούμενοι ὡς οἱ βήσσοντες καὶ πταίροντες καὶ μυκώμενοι καὶ ὑλακτοῦντες καὶ στενάζοντες.
>
> Epicurus said that they [the first humans] did not assign names to things by intelligence, but prompted by natural instinct, like coughing and sneezing, mooing and howling, and moaning.

Proclus' comment seems only to refer to the production of sounds according to internal stimuli: a tickle in the throat causing coughing, a cow's feelings causing it to moo, etc., and not to the relationship between internal and external stimuli in the production of sounds as in L. and Epicurus, and this would not seem to explain the origin of *names per se*. His use of onomatopoeic words, however, *βήσσοντες, πταίροντες, μυκώμενοι, ὑλακτοῦντες* may suggest that the idea of a relationship between words and things is seen in terms of onomatopoeia, at least by Proclus. That is that a particular sound will be produced by a particular stimulus, and so will have some sort of relationship with that stimulus rather than being entirely randomly produced.

In L.'s analogies, only the crows' (1083–6) response to changes in the weather is explicitly an interaction between animals and their environment causing particular sounds.

However, since the other animals are shown producing different sounds according to mood in different situations, we may assume that there is an implicit idea of reaction to environment present in each of the analogies.

1056. postremo: the didactic progression begins with *at* (1028), then *proinde* (1041), *praeterea* (1046), and lastly *postremo*. *Praeterea* may be more properly included as a stage within the anti-νομοθέτης argument itself, and so we have a tricolon, the third stage beginning here.

quid in hac mirabile tantoperest re: there is no need for wonder at human language ability. We should remember that the didactic function of book five, as L. presents it at 5.55 ff., is to remove wonder at the sort of things that may lead to the attribution of temporal powers to the gods (see 5.83–4). Language is one of these things he must explain (5.71–2), along with the mortality of the world (5.64–6), its origin (5.67–9), the origin of species (5.69–70), the origin of religion (5.73–5), and especially astronomy (5.76–81, 84–5). In particular it is wonder at the regularity of the heavens that led, and leads, to religion (5.82–90 and 5.1161 ff.), and as I have said above (introduction to 1028 ff.) language is heavily implicated in the development of the false ideas that led to religion.

1057. si genus humanum, cui vox et lingua vigeret: here there is no qualification of humanity as there is in 925 'genus humanum . . . *illud*', and the first humans are presented as possessed of the same vocal abilities as modern humans. Thus, there is no idea of an evolutionary development of the physical equipment necessary for language, and we may assume that the first humans arose from the earth with fully formed vocal cords, tongues, etc. Empedocles B62 DK, however, describes how the first 'whole natured forms' of men and women lacked tongue or language (see Wright ad loc.). This fragment appears to be the only one detailing the zoogony under 'Strife', however (Wright ad loc.), and it is not clear that in the zoogony under 'Love' (which corresponds closely to L.'s zoogony) we would find such a voiceless stage of development. L. explicitly describes the extinction of mute creatures (841), and the possession of a voice thus seems to be a requisite for the survival of a species in his scheme of adaptation (see notes to 837 ff.).

1058. pro vario sensu varia res voce notaret: see introductory note to 1056 ff. The crucial point is the dissimilarity of sounds produced according to different moods and different sense perceptions, and this forms the substance of the passage following. The idea is repeated at 1060, 1065, 1070, 1073, 1077, 1081, 1083, 1088, and 1090. *Sensus* can mean both 'emotion' and 'sense perception' in a way analogous to the English 'feel/feelings' which describes both internal and external stimuli and gives an idea of the role of sense perception in the formation of emotions (*OLD* 1735 s.v. *sensus* 1 and 7; Solmsen, 1961, on αἴσθησις).

1059. cum pecudes mutae: although they can produce sounds, animals are mute in that they cannot produce words (cf. 1088). *Mutus* can also describe soundless animals (cf. 2.342 and 2.1082 used of fish, and 841 of the *portenta*) but commonly describes animals' lack of language (Costa ad loc.). The apparent oxymoron and the mock concessive force of *mutae* strengthens the argument: 'even dumb animals can speak', cf. the conclusion corresponding to this proposition at 1087–8 'animalia . . . | muta tamen cum sint'.

cum denique saecla ferarum: a contrast is drawn between tame and wild animals, and this serves to universalize the argument: 'the whole animal kingdom, wild and tame . . .'. The tame animals are represented below by the Molossian hounds and perhaps the stallion, and the wild animals by the various birds. On the wild/tame dichotomy see above on 939.

1060. voces: see above, introductory note to 1056 ff., and on 1058. The use of *voces* for animal sounds underlines the conceptual similarity of human and animal utterance, cf. *vox* and *voce* of humans in 1057–8, 1090, and of animals in 1066, 1070, 1081, 1088. Although L.'s use of the same word for human speech and animal noises is pointed here, it is often used of animals without any obvious comparison with human speech, cf. *DRN* 4.992; Verg. *A*. 8.217; Cic. *Arat. Progn.* 217; Pliny *NH* 10.39 (*OLD* 2104 s.v. *vox* 5a).

1061. metus . . . dolor . . . gaudia: the three emotions, fear, pain, and joy, are perhaps the most basic of all, and those which may be expected to produce entirely instinctive utterances in animals, and in humans as well. This aids the argument that language arises from natural production of sounds. All three illustrate the twofold nature of *sensus*, comprising both internal emotion and externally caused sense perception. Fear and pain especially may be seen as responses to external stimuli. Joy is less obviously externally caused, but the two illustrations following: the dogs with their puppies, and the stallion amongst the mares, strongly suggest that joy is also viewed in a similar way. Rage (*rabie* 1065) is not mentioned here.

Lines 1063–1072: sounds made by dogs

This description of noises made by dogs is full of onomatopoeic sounds (Costa ad loc.): the 'r's, 'd's and 'm's of 1063–5 representing growling, the echoing vowels of 1066 barking, the 'l's of 1067 licking, the 's's of 1068–9, and the 'au' and 'ae' sounds of 1071 the howling of the dogs locked in the house. The explicitly onomatopoeic *latrant* (1066) and *baubantur* (1071) provide an oblique onomatopoeic argument that reinforces the idea of the naturalness of words. The technique is continued with *hinnitus* of horses, and the crows and ravens with their onomatopoeic names *cornix* and *corvus* (1083–6) may also provide a further hint. L.'s main argument is not explicitly an onomatopoeic one: he is not claiming that the first words arose either as imitation of animal sounds or as attempts to render something of the nature of objects in sounds that describe their characters or attributes. However, the technique is the same as that of Proclus commenting on Cratylus' theory of the natural origin of names (*In Plat. Crat.* 17 = fr. 335 Us., see above, introduction to 1056 ff.), and so it may well be that both L. and Proclus have in mind some sort of onomatopoeic explanation for the origins of words. Further, L. does give the origins of singing as imitation of bird song (1379–83). In this he agrees with Democritus (DK68 B154), and so it is probable that Democritus' θέσις theory of the origin of language (DK68 B26) contained an onomatopoeic component, and perhaps some vestige of this remains in L. not clearly separated from the theory of natural production of words in response to external stimuli.

In modern thinking, two separate but related theories, the Imitation (or 'Bow-Wow') theory and the Natural Sound (or 'Ouch') theory, illustrate the conceptual closeness of onomatopoeic and instinctive cry theories of the origin of language. Parrot Hickerson (2000, 7) quotes Sir John Lubbock (1874):

> Many names of animals such as cuckoo, crow, peewit, &c, are evidently derived from the sounds made by those birds. Everyone admits that such words as bang, crack, purr . . . &c . . . have arisen from the attempt to represent sounds characteristic of the object it is intended to designate. Take again the inarticulate human sounds—sob, sigh, moan, groan, laugh, cough. . . . I cannot but think that we may look upon the words above mentioned as the still recognizable descendants of roots which were once onomatopoeic in their origin.

Lubbock closely associates as 'onomatopoeic' both renderings of instinctive human cries in words and imitation of animal sounds. His argument would seem to be that the process of coining words is the same in both cases: imitation of a natural sound to produce a descriptive word. In the Epicurean theory, of course, animal and human sounds are even more closely related since both result from interaction between external and internal stimuli; the main difference between them being that by this process humans produce words, and animals only sounds (see above, introduction to 1056 ff.).

1063. canum . . . Molossum: Molossian hounds were a famous breed of hunting and sheep dog originally from Epirus (see Arist. *Hist. An.* 608^{a}26 ff.; Aristoph. *Thesm.* 416; Gratius *Cyn.* 181; Nemes. *Cyn.* 107; Verg. *G.* 3.405; Hor. *Epod.* 6.5, and *Sat.* 2.6.114, from Costa ad loc.).

1066. et cum iam latrant et vocibus omnia complent: for *vocibus* of barking see note to 1060, and for the onomatopoeic *latrant* see introduction to 1063 ff. above. The comparison is explicitly between the soft growling and loud barking, but there is also an implicit suggestion of different forms of *communication* by dogs, with the two different sorts of threatening sounds carrying different messages for the hearer. This is not entirely necessary for L.'s argument that different feelings produce different sounds, even from animals, and he does not explicitly claim that animals do have language in the same way as humans, but the suggestion of it does add an extra dimension to the analogy between human speech and animal noises.

1071. baubantur: for the use of onomatopoeia see introduction to 1063 ff. Compare Proclus' use of ὑλακτοῦντες 'howling' (*In Plat. Crat.* 17 = fr. 335 Us., see introduction to 1056 ff.), the Greek cognate βαΰζω, and the English 'baying' and 'bow-wow'. Fittingly for Epicurus' explanation of variation in language according to geography and physical make-up, animal sounds are represented by different onomatopoeic words in different cultures, e.g. Afrikaans: woef, Albanian: ham ham/hum hum, Arabic (Algeria): haw haw, Croatian: vau-vau, Indonesian: gonggong, Thai: hoang hoang (with falling tone). Italian dogs still say 'bau bau', however. (From Cathy Ball, 'Sounds of the World's Animals', available online at: http://www.georgetown.edu/cball/animals/dog.html accessed 10 April 2003.)

Lines 1073–1077: sounds made by a stallion

1073. hinnitus: cf. *hinnit* 1077. Although the dogs growl (1065), bark (*latrant* 1066), and bay (*baubantur* 1070), the stallion only whinnies, and L. uses the same onomatopoeic word for the different sounds produced. This may be due to a lack of onomatopoeic words for horse sounds in Latin, as in English ('whinny' and 'neigh' seem to be the two main words and seem to represent the same horse sound), but the technique of argument is somewhat different than with the dogs: their 'language' is proved by matching their variety of sounds with a variety of onomatopoeic words, but the repetition of *hinnitus* . . . *hinnit* to describe the different sounds of the horse suggests a slightly different point, that even given the horse's lack of vocal range he still produces a variety of sounds according to mood. As with dogs, different onomatopoeic words are used in different languages for horse sounds, but the range does seem smaller than for dog sounds, e.g. Albanian: hi hi hi, Bengali: choo-hu-hu, Estonian: ihahaa, Finnish: ii-hahahaa, French: hiiiiii, Hindi: hin-hin-hin, Hungarian: nyihaha, Icelandic: hoho, Thai: hee hee (with high tone), Ukrainian: ii-ha-ha (from Cathy Ball, 'Sounds of the World's Animals', available online at:http://www.georgetown.edu/cball/animals/horse.html, accessed 10 April 2003).

1074. florenti aetate iuvencus: see above on 888.

1075–6. pinnigeri saevit . . . edit ad arma: Gale (1994, 106 n. 37, cf. Gale, 2000, 237 n. 21) compares *Il.* 6.506–11. The picture is of winged Amor riding the stallion and spurring it into a sexual frenzy. Similar imagery is used by Vergil in *A.* 6.100–1 where the Sibyl is goaded to inspired frenzy by Apollo:

> ea frena furenti
> concutit, et stimulos sub pectore vertit Apollo.

arma represent the mating battles of stallion and mares, rather than making a separate point on the sounds of a horse in warfare as Lachmann would have it (see Lambinus ad loc. 'quaenam arma Martiane an Venerea?', and Smith ad loc.), as shown by Vergil's imitation at *G.* 3.83 ff., compare 3.85: 'collectumque fremens volvit sub naribus ignem', and 3.98 of stallions and mares mating: 'si quando ad proelia ventum est'. This pattern of argument is inverted in 1081–2 where birds make different sounds 'at other times' and when they are fighting over food.

The idea of the goads of love may be found in Eur. *Hipp.* 38–9, and Pl. *Rep.* 573a7 (Costa ad loc.), but the idea of love producing a form of mania is of course treated in 4.1037 ff. There the mechanism of sexual arousal is explained: *simulacra* arriving from an attractive person enter the eye (or impinge directly upon the mind of a sleeping person, 4.1030–6) and cause the production of seed in the limbs. This leads to an urge to expel the seed toward the object of desire, and sexual lust is explained as a mechanistic process (see Brown ad loc.). Thus, the spurs of love by which the stallion is struck here are not simply metaphorical but are the physical effects of the *simulacra* themselves, as made clear in 4.1053: 'sic igitur Veneris qui telis accipit ictus'.

In *G.* 3.209 ff. Vergil enters into a 'dialogue' with L. on the mania of love, and the role of Venus in the creation of life and the foundations of society. He focuses on subverting L.'s positive presentation of Venus as the creatrix of all life in *DRN* 1.1 ff., the softening effects of love in the origins of society (5.1011 ff.), and L.'s separation of lust from romantic love (3.266–7: 'scilicet ante omnis furor est insignis equarum | et mentem Venus ipsa dedit', cf. *DRN* 4.1058: 'haec Venus est nobis; hinc autemst nomen

Amoris'), and gives a dark picture of the effects of love similar to that of L. 4.1084 ff. These are exemplified especially by bulls, boars, and stags battling for mates, the uncontrollability of horses when inflamed by lust, and by the *hippomanes* that caused the mares of Glaucus to devour him, in imagery clearly borrowed from 5.1298 ff., the 'beasts in battle' (see esp. Know, 1992; Miles, 1975; Fitzgerald, 1984; Segal, 1986). This small picture of the stallion running wild goaded by lust, and the linking of love with warfare, agrees more with the negative Epicurean view of love than with the view of L.'s hymn to Venus in the proem to book one (see further Catto, 1988–9; Sedley, 1998, ch. 1, Kleve, 1969).

1077. alias: the other circumstances in which a stallion makes a different kind of whinnying are left vague with just *alias* 'at other times'/'otherwise', and we are not told whether the limbs are struck by some external force, which would match the imagery of *ictus Amoris* (1075), or whether by an internal emotion, perhaps by fear (Costa ad loc.). The latter would perhaps match the context of sounds differing according to mood better.

Lines 1078–1086: sounds made by birds

1078–82. Gale, 2000, 237 compares *Il.* 2.459–63, and discusses L.'s inversion of Homeric similes. The proof of the early humans' innate linguistic ability by appeal to the variety of animal sounds continues with the third part of the tricolon: dogs, horses, and now birds. The dogs and horses may be considered as representative of tame animals, and the birds of wild animals. Thus, they serve to universalize the argument following the pattern of 1059: 'cum pecudes mutae, cum denique saecla ferarum', sc. 'the whole animal kingdom, wild and tame'. This universalization is aided by the variety of birds we are given, in contrast to the single example for dogs and horses. The argument is not quite that the variety of sounds produced by different species of birds proves an innate human linguistic capability, but it does help in the poetic argument to broaden the force of the analogy obliquely.

1078. genus alituum variaeque volucres: see above on 5.801. **postremo:** at 801 we may read *principio* as either 'firstly' or 'in the beginning' according to our taste (see note ad loc.), and while the use of *postremo* here in the clearly logical progression underlines the interchangeability of the didactic and chronological progressions, it does lend some authority for reading *principio* in 801 as the first point in the argument rather than as describing birds as the first creatures to be created.

1079. **accipitres:** hawks are pressed into service for two other arguments in *DRN*: at 3.751–2 the inheritance of behavioural characters is used to refute the transmigration of souls across the species barrier: if transmigration were possible the hawk would flee the dove. At 4.1009–10 dreams of hawks wake sleeping birds and set them to flight. Here the hawk adds colour and wildness, and aids the universalization of the argument with a further division, between land birds and sea birds, to add to the wild/tame divide.

ossifragae: probably the lammergeyer or bearded vulture (*OLD* 1274), now *Gypaetus barbatus*, a scavenger which breaks open bones with its powerful beak to obtain the marrow, rather than an osprey or sea eagle as usually translated (Costa ad loc.), see Pliny *NH* 10.11: 'genus aquilam quam barbatam vocant'. Pliny's confusion of the bearded vulture with an eagle is not surprising since they are considered as a link between vultures and eagles. See 'The Hawk Conservancy' online at: http://www.hawk-conservancy.org/priors/lammer.htm (accessed 10 April 2003).

So, we have two land birds and one sea bird here. See further on 1081–2 below.

mergique: if the *ossifragae* are bearded vultures, then these diving birds are the only sea birds referred to here, and they alone are described seeking life and livelihood in the salt sea waves.

1080. **victum vitamque petentes:** the same phrase used of the cicadas at 804 (see above).

1081–2. **longe alias . . . praedaeque repugnant:** again the central argument is repeated as at 1058, 1060, 1065, 1070, 1073, 1077, 1081, 1083, 1088, and 1090: animals make different sounds according to different emotional and environmental stimuli.

The formula *longe . . . alio* is repeated from 1065 and 1070, and the repetition is didactically useful in driving the point home. Again, animal sounds are described as *voces*, underlining the conceptual similarity between human and animal utterance (see on 1060 above).

1083–6. Now we are given a picture of animals responding to external environmental stimuli in the production of sounds, whereas with the dogs and the stallion the differentiation between external and internal stimuli is less clear (see introduction to 1056 ff.). The argument thus moves from *sensus* as more nearly purely emotion with the dogs, to *sensus* as more explicitly sense perception with the crows, and thus we are led towards the Epicurean idea of language as the result of interaction with environment from a starting point more nearly in line with the Vitruvian/Diodoran tradition (see introduction to 1028 ff.).

Both the words *cornix*, the crow, and *corvus*, the raven, are probably onomatopoeic in origin (*OLD* 446 and 451, Varro *LL* 5.75, Maltby, 159) and thus along with the onomatopoeic etymology of the crow's cawing in '*aquam* dicuntur . . . poscere', we are given a further hint at an onomatopoeic basis for the Epicurean theory (see also introductions to 1056–62 and 1063–72).

Crows are useful to L. for their ability to change their cries according to the weather, thus providing him with an excellent example of variation in cries according to environmental change, and the widespread superstition that this ability actually foretold the weather provides him with an opportunity to give a rational explanation of the phenomenon: they change their cries according to the weather, and not vice versa.

Crows were famous as weather prophets and were thought also to summon bad weather, as in Verg. *G.* 1.388 'tum cornix plena pluviam vocat improba voce' (but cf. *G.* 1.415–23 with Gale, 2000, 85 n. 85, and 132–3). See also Aratus *Phaen.* 949–53; Lucan 5.555–6; Hor. *Carm.* 3.17.12–13 (*TLL* 4.961.35 ff.). Pliny *NH* 18.362–3 describes the changes in the crow's cries:

> Grues silentio per sublime volantes serenitatem, sic et noctua in imbre garrula, at sereno tempestatem, corvique singultu quodam latrantes

seque concutientes, si continuabunt, si vero carptim vocem resorbebunt, ventosum imbrem.

They were also important birds of omen in more arcane augury, see e.g. Plaut. *As.* 260; Cic. *ND* 3.14, *Div.* 2.78, *Ac.* 2.128; Isid. *Orig.* 12.7.44; Verg. *Ecl.* 9.15; Phaed. 3.18.12; Suet. *Dom.* 23.2 (*TLL* 4.961.13 ff.). The longevity of ravens was also famous, see Hes. fr. 304 M–W; Aristoph. *Av.* 609; Cic. *Tusc.* 3.69; Ov. *Met.* 7.274; Sen. *Ben.* 2.29.1 (*TLL* 4.961.71 ff.).

Interestingly, in the context of L.'s argument, crows and ravens were often thought to be able to speak or imitate human speech, see e.g. Varro *LL* 6.56; Pliny *NH* 10.124; Ov. *Am.* 3.5.21 (*TLL* 4.961.52 ff.). This may well aid the analogy between human and animal speech.

1084. raucisonos: another onomatopoeic word, the compound found only here, at 2.619, and Catullus 64.263, both of the noise of horns. L.'s other epithet for the voices of crows is *rauca* as at 6.751–2: *raucae* | *cornices* found also in Hier. *Epist.* 40.2 (*TLL* 4.961.65 ff.), but again it is much more commonly used of the sound of horns (e.g. Lucan 1.238; Ov. *Met.* 4.391–2; Prop. *Eleg.* 3.3.41; Verg. *A.* 8.2).

1087–90. This is the proof of the conclusion stated at 1056–61.

1087. sensus: see on 1058 above.

1087–8. animalia . . . | muta tamen cum sint: cf. *pecudes mutae* 1059 (see above).

1089. quanto . . . magis aequumst: 'How much more reasonable it is . . .'. As in the proposition 'quid in hac mirabile tantoperest re' 1056, L. does not claim that the vocal and linguistic abilities of animals and primeval humans are identical, but only relevantly similar. This would be forced upon him by the diachronic nature of the analogy, and by the fact that the analogy is between different species, but would also be necessary because animals, although they do produce different sounds according to particular stimuli, do not produce words. As I have said above (introduction to 1056–62), in the Epicurean theory it would seem that the abilities of animals to respond to their environment and emotions with different sounds and the original human ability to produce the names of things naturally are conceptually very close since they arise by the same mechanism. As Everson puts it (1994, 97):

> The variety of sounds caused in animal species by different emotions would only be relevant if emotions and perceptions were taken to be relevantly similar—and that relevant similarity is, of course, that they are all psychological affections. Just as the noises of animals correspond to different emotions, so the noises made by humans correspond to different perceptions and thereby to different objects. This directly follows Epicurus' claim in *Ep. Hdt.* 75 that 'each of the affections and *phantasmata* caused them to exhale breath peculiarly'. The exhalations will all reveal the psychological affections of the speaker—it is just that in the case of perceptual affections, the affections will themselves be related to particular types of object in the world.

mortalis: see above on 791.

§8 Lines 1091–1104: The Origins of Fire and of Cooking

This discussion of the origins of fire may seem out of place since it has already been assumed that humans have obtained fire at 1011 ff., and clearly the chronological progression would place this discovery just before the events described in 1011–27, but the holding over of fire is explained by the tension in Lucretius' account between giving a neat chronological sequence from the beginnings of life to modern civilization and examining the origins of each art and technology individually, just as in the case of the origins of language. The chronological progression is picked up again at 1105 ff., and is again interrupted by the origins of religion at 1160 ff. From 1241 onward, with the history of civilization essentially complete, the chronological progression is finally abandoned, and the individual arts are discussed in a loose temporal framework. Fire is the most crucial of the technologies to the physical and social evolution of humanity, and so merits a section of its own. It is also particularly important for L. to give a rational anti-teleological account of the discovery of fire, since mythological prehistory also privileges fire as the key to human progress.

Cooking may seem to be a less important discovery, but the two topics are obviously closely interrelated, cf. Hyg. *Astr.* 2.15.2:

> *Iuppiter* cum factum rescisset, animo permoto *mortalibus eripuit ignem*, ne Promethei gratia ⟨pl⟩us deorum potestate ualeret, neue carnis usus utilis hominibus uideretur, *cum coqui non posset.*

And just as in Hippoc. *De Vet. Med.* 3.26, it can be seen as one of the crucial steps humanity took on the road to civilization. The first humans ate raw wild foods, and so were in the condition of animals. As often in Greek and Roman thought, humanity is distinguished from the animals, and characterized, by eating tame and cooked foods rather than raw wild ones, and the transition between the two marks the differentiation of humans from animals (see esp. Segal, 1974).

Lines 1091–1101: fire

In most ancient accounts of prehistory, fire is assumed to have been lacking from the lives of early humans. Exceptionally, Plato *Laws* 3.676 ff. allows it them. Lucretius is of course not the only writer to explain the discovery of fire rationally (cf. Democritus' book title *Αἰτία περὶ πυρὸς καὶ τῶν ἐν πυρί* DK68 A33 (Diog. Laert. 9.47); Diod. Sic. 1.8; Vitruv. *De Arch.* 2.1; Verg. *G.* 1.135), but the idea of fire as a divine gift is very strong, cf. *Hom. Hymn Herm.* 3; Hes. *Op.* 50 ff. and *Theog.* 535 ff.; Pl. *Prt.* 320c ff. and *Plt.* 274c–d. Prometheus as giver of fire and technology, as in Hes. Aesch. *PV* 436–506; Pl. *Prt.*; Apollodorus 1.7.1; Phoroneus in Paus. 2.19.5, is open to a variety of interpretations: he may be a god, a Titan, an outstanding human, or a personification of human reason (see Blundell, 1986, 10–11, 16–18, 168–75; Havelock, 1957, 52–73). But, even as a personification of human reason as culture hero, he is inadmissible in the Epicurean scheme, where all people are Promethean, and no art or technology needs an outstanding intelligence as its originator. Further, the Epicurean approach is gradualistic, and so precludes any kind of *νομοθέτης*, human or divine: all arts developed by the interaction of experience and necessity over time, cf. Diogenes of Oinoanda fr. 12.II.4–11 Smith:

II εἰς οὖν οὐδεμίαν τέχνην,
[ὥς ο]ὐδὲ ταύτας, οὔτ᾽ ἄλ-
λον τινὰ θεῶν οὔτε
τὴν Ἀθηνᾶν παραλημ-
πτέον· πάσας γὰρ ἐγέν-
νησαν αἱ χρεῖαι καὶ πε-
ριπτώσεις μετὰ τοῦ
χρόνου.

So no arts, [any more than] these, should be explained by the introduction of Athena or any other deity; for all were the offspring of needs and experiences in conjunction with time. (Trans. Smith)

(Cf. *DRN* 5.1448–57, *Ep. Hdt.* 75.)

In *Protagoras*, humans were given fire to enable them to survive since they were weak and naked. Lucretius reverses the argument: in 1011 ff., humans became weaker and more naked as the result of using fire. Vitruvius *De Arch.* 2.1 gives the discovery of fire as the chief cause of the first human gatherings, thus leading to the development of language, technology, and civilization (see Cole, 1990). Lucretius has fire weakening the early human physical constitution so that houses become necessary and cohabitation possible. This leads to marriage, and child-care, and so to a psychological softening that makes a civil society possible. This seems an inversion of the myth of Pandora in Hesiod (*Op.* 69–82), where the invention of women (and thus of love and sex) causes the previously happy, all-male human race sorrow, misery, and death. For Lucretius, the beginnings of regular sex, marriage, and child-care are a prerequisite for the survival of the race (see above on 5.1026).

In Aesch. *PV*, the human race lived a miserable existence under the rule of Zeus, until Prometheus granted them fire and technology, and unlike in Hesiod, it is Prometheus who is punished for his audacity. In Pl. *Plt.* 274c–d, the food that had once grown spontaneously had now failed, and so in order to save the human race Prometheus gives them fire, and other gods give other technologies. The Cynics, with their extreme cultural primitivism, and rejection of civilization, disparage Prometheus for giving humans fire, since fire began the process of the development of civilization, which in their view has been disastrous for human happiness (cf. Dio Chrys. *Orat.* 6.25, 29–30; Plut. *Aq. an Ign.* 2956 B. See Cole, 1990, 150 n. 4).

1091. tacitus ne forte requiras: an implied objection from the reader, perhaps Memmius, abandoning the dramatic didactic setting of a dialogue between instructor and pupil for a more literary convention: the reader is *tacitus* because he is simply reading the work (Volk, 2002, 80 sees L. self-consciously mocking didactic convention here). Compare the explicit rejoinders of the addressee at 1.803 ff. and 1.897 ff.: *'at . . .' inquis*. The latter also in the context of the production of fire, which perhaps informs the use of this device here (see below on 1096–1100).

1092–3. fulmen . . . ardor: a rationalizing of the Prometheus myth (cf. Gale, 2000, 114–15): fire did indeed originally come down from the heavens, but by the arbitrary mechanism of lightning rather than as any divine gift. Gale (1994, 178 n. 71) notes the emphatic position of *fulmen*: 'It was a *thunderbolt* (sc. and not Prometheus) which first brought down fire to earth . . .'. Cf. the myth given straight by Hyginus *Fab.* 144.1:

> Prometheus in ferula detulit in terras, hominibusque monstrauit quomodo cinere obrutum seruarent.

Aesch. *PV* 506: πᾶσαι τέχναι βροτοῖσιν ἐκ Προμηθέως. Hephaestus plays the same role in the Homeric *Hymn to Hephaestus* 1–3:

> Ἥφαιστον κλυτόμητιν ἀείδεο Μοῦσα λίγεια,
> ὃς μετ᾽ Ἀθηναίης γλαυκώπιδος ἀγλαὰ ἔργα
> ἀνθρώπους ἐδίδαξεν ἐπὶ χθονός . . .

Sing, clear-voiced Muse, of Hephaestus famed for inventions. With bright-eyed Athena he taught glorious crafts to men on earth . . .

Cf. Similar rationalizations by Diod. Sic. 1.13.3, and Tzetzes 74.14–20 Gaisford (Gale, 1994, 178).

1096–1100. et ramosa . . . stirpesque teruntur: for the same explanation cf. Vitruv. *De Arch.* 2.1, who may follow Lucretius here:

> interea quodam in loco ab tempestatibus et ventis densae crebritatibus arbores agitatae et inter se terentes ramos ignem excitaverunt.

This mechanism, unlike the former, also implicitly supplies the explanation of how the first humans learned to make fire: the rubbing of the branches gave them the *notities* of making fire by rubbing sticks together (Bailey ad loc.). Cf. 1252 ff. where metals melted in a forest fire provide the *notities* of smelting, 1361 ff. where *natura* provides the *specimen* for sowing and grafting, and 1379 ff., singing from imitation of birds, and playing of pipes from wind whistling through hollow reeds. The technique is familiar from Democritus DK68 B154:

> *γελοῖοι δ᾽ ἴσως ἐσμὲν ἐπὶ τῶι μανθάνειν τὰ ζῶια σεμνύνοντες, ὧν ὁ Δ. ἀποφαίνει μαθητὰς ἐν τοῖς μεγίστοις γεγονότας ἡμᾶς· ἀράχνης ἐν ὑφαντικῆι καὶ ἀκεστικῆι, χελιδόνος ἐν οἰκοδομίαι, καὶ τῶν λιγυρῶν, κύκνου καὶ ἀηδόνος, ἐν ὠιδῆι κατὰ μίμησιν.*

> But perhaps we are absurd to put on airs, because we are teachers of the beasts; for Democritus declares that we have been their pupils in matters of the greatest importance: imitators of the spider in weaving and mending, of the swallow in architecture, and of the clear-voiced swan and nightingale in singing. (Trans. L&B)

1097–9. . . . arbor | . . . ardor: the atomic explanation for the production of fire by trees rubbing together is given at 1.897 ff. Neither wood nor fire is an elemental substance, but they do contain similar varieties of atoms. Fire itself is not contained within the wood, as Anaxagoras would have it, but it is caused by the many seeds of heat contained in the wood flowing together under friction. Just as a slight change of the letters of the word *lignum* produces the word *ignis* (1.912–14), thus a rearrangement of the atoms of wood produces fire: one of Lucretius' famous letters/atoms analogies for the ability of the atoms to create all varieties of matter (cf. 196–7, 1.817–29, 2.688–99, 2.1013–21), and often taken as a metaphor for the creation of *DRN* itself as a simulacrum of the universe (see esp. Thury, 1987), and as a description of L.'s intertextual technique: as the atoms form new compounds by rearrangement, so L. creates a new meaning from materials appropriated from mythological and teleological contexts (see esp. Fowler, 2000*a*, 148). The play on *arbor/ardor* in 1097 and 1099 reminds us of this atoms/letters analogy, and perhaps is more effective than *lignum/ignis*, since the latter, as Smith notes on 1.901, seems to emphasize Anaxagoras' false contention that wood *contains* fire ready-made.

Lines 1102–1104: cooking

As I say above, the ideas of the raw and the cooked, and the wild and the tame, as indicators of bestiality and humanity were very strong in the ancient world (see esp. Segal, 1974). The change from the raw to the cooked in human diet is less frequently mentioned than from the wild to the tame, but the two ideas are closely connected, as a process of softening and civilizing (for the wild to the tame diet cf. Moschion fr. 6, Eur. *Suppl.* 201 ff.; Pl. *Prt.* 320c ff.; Diod. Sic. 1.8). Famously, the Homeric Cyclopes eat their food raw, especially people (*Od.* 9.287 ff.), and L.'s first humans also eat raw wild food, and are reminiscent of the Cyclopes (see on 993 ff.). The Cynics, with their extreme cultural primitivism, took the opposite view, and insisted that raw food was the natural human diet and cooking against nature (e.g. Julian *Orat.* 6.191–3), a view satirized in the story of Diogenes' death from eating a raw octopus (Diog. Laert. 6.76). The Hippocratic *De Vet. Med.* gives the discovery of cooking as the key to the development and survival of the human race, 3.29–40:

> ἄλλα τε συχνὰ περὶ ταύτην πρηγματευσάμενοι, ἥψησάν τε καὶ ὤπτησαν, καὶ ἔμιξαν, καὶ ἐκέρασαν τὰ ἰσχυρά τε καὶ ἄκρητα τοῖσιν ἀσθενεστέροισι, πλάσσοντες πάντα πρὸς τὴν τοῦ ἀνθρώπου φύσιν τε καὶ δύναμιν, ἡγεύμενοι, ὅτι ὅσα μὲν ἂν ἰσχυρότερα ᾖ, οὐ δυνήσεται κρατέειν ἡ φύσις, ἣν ἐσβάλληται, ἀπὸ τουτέων δ' αὐτέων πόνους τε καὶ νούσους καὶ θανάτους ἔσεσθαι· ὅσων δ' ἂν δύνηται ἐπικρατέειν, ἀπὸ τουτέων τροφήν τε καὶ αὔξησιν καὶ ὑγιείην. τῷ δ' εὑρήματι τούτῳ καὶ ζητήματι τί ἄν τις οὔνομα δικαιότερον ἢ προσῆκον μᾶλλον θείη ἢ ἰητρικήν; ὅτι γε εὕρηται ἐπὶ τῇ του ἀνθρώπου ὑγιείῃ τε καὶ τροφῇ καὶ σωτηρίῃ, ἄλλαγμα κείνης τῆς διαίτης, ἐξ ἧς οἱ πόνοι καὶ νοῦσοι καὶ θάνατοι ἐγίνοντο.

Experimenting with food they boiled or baked, after mixing many things combining the strong and the violent with the weaker components so as to adapt all to the constitution and power of humanity, thinking that from too strong foods which the human constitution cannot assimilate when eaten, will come pain, disease and death, while from such as can be assimilated will come nourishment, growth and health. To this discovery and research what juster or more appropriate name could be given than divine medicine, seeing that it was discovered with a view to the health, saving and nourishment of humanity, in place of that diet from which came pain, disease and death. (Trans. L&B)

Athenio exaggerates the importance of the discovery of cooking for comic effect (Ath. *Deipnos.* 14.80.7–15):

> [A.] *οὐκ οἶσθ’ ὅτι πάντων ἡ μαγειρικὴ τέχνη*
> *πρὸς εὐσέβειαν πλεῖστα προσενήνεχθ’ ὅλως;*
> [B.] *τοιοῦτόν ἐστι τοῦτο;*
> [A.] *πάνυ γε, βάρβαρε.*
> *τοῦ θηριώδους καὶ παρασπόνδου βίου*
> *ἡμᾶς γὰρ ἀπολύσασα καὶ τῆς δυσχεροῦς*
> *ἀλληλοφαγίας ἤγαγ’ εἰς τάξιν τινὰ*
> *καὶ τουτονὶ περιῆψεν ὃν νυνὶ βίον*
> *ζῶμεν.*

A. Don’t you know that the art of cookery has contributed more than any other to piety?
B. Do you really mean this?
A. Absolutely, barbarian, for it has freed us from the bestial and uncontrolled life and the hateful devouring of one another; it has brought us to a certain order, and has fashioned for us this life which we now live. (Trans. L&B)

Cookery has saved us from a *θηριώδης βίος*. (See Wilkins, 2000.)

1103. sol docuit: compare the same cooking technique used by the Kunokephaloi of Ctesias *Indica* 22. Perhaps also the ‘Tables of the Sun’ of the Ethiopians in Herodotus 3.23, from which they miraculously receive cooked meat, represent a similar tradition (see Romm, 1992, 78 ff., and 56 ff.).

1103–4. mitescere . . . | verberibus . . . victa: cooking is presented as a softening process here in 1102–4 (cf. 1102 *mollire*, 1103 *mitescere*), and so reminds us that this same softening, also brought about by fire, marks the threshold of humanity which the first humans cross in 1011–27. They too are weakened and overcome by their environment, and the change is also described in violent language (cf. 1017: ‘Venus imminuit viris’, 1018: ‘fregere ingenium superbum’, 1104: ‘verberibus . . victa’). Again, the same idea of softening as a taming and civilizing process is found at 5.1366–9, there of domesticating wild plants:

> et nova defodere in terram virgulta per agros
> inde aliam atque aliam culturam dulcis agelli

temptabant fructusque feros mansuescere terra
cernebant indulgendo blandeque colendo.

This is part of the battle against wild nature, 5.1370–1:

inque dies magis in montem succedere silvas
cogebant infraque locum concedere cultis.

Cf. 5.206ff. on the battle against nature. There the world is proved not to have been created for humans by the necessity of creating a human space by constantly driving back nature by force (see Fowler, 1996*a*, who discusses ancient and modern concepts of science as an act of violence against nature, defending L. against a charge of scientific misogyny).

At 1105–7, L. makes it clear that this process of modifying nature was crucial in the rise of civilization:

inque dies hi *victum vitamque* priorem
commutare novis monstrabant rebus et *igni*
ingenio qui praestabant et corde vigebant

Humans become truly human, and finally civilized when they have been mastered by fire, marriage, and love, and when they in turn master nature with new technologies. Fire and cooking were chief among these. Domestic science was the most important subject on the syllabus of the University of Life.

APPENDIX A

Table of Themes in Accounts of Creation, Zoogony, and Anthropogony

THIS table is intended to be a convenient guide to the main ancient sources on creation. Many of the fragments of the Presocratics on cosmogony, zoogony, and anthropogony are conveniently collected by Havelock, 1957, 104 ff. (who unfortunately ignores Empedocles), KRS, Blundell, 1986: 24–53, and L&B (*passim*). This table makes no distinction between philosophy, mythology, or poetry, but inevitably, such a structuralist division into themes imposes another kind of editorial bias. Readers are welcome to disagree with the categories, and to supply their own. Note that mythological accounts, especially, are rarely as straightforward as they may appear from the table. For example in the story of Deucalion and Pyrrha in Ovid *Met.* 1, humans are born from stones, but Deucalion and Pyrrha also have descendants of their own. In Hesiod's *Works and Days*, only the bronze race are born from the ash tree; no explanation of the physical origin of the other races is given, and Pandora, the first woman, is the only human in Hesiod to be moulded from earth and water. The table is by no means exhaustive, and the omission of any reference should not be taken to signify anything other than my own ignorance. The symbol — indicates that the theme does not appear in L., and a question mark before an entry indicates either that it is unclear whether the theme is present, or the report is of doubtful authenticity. The references to Presocratic philosophers (DK) are those of H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker* (Berlin, 1952).

Humans

Theme	*DRN/Epicurean Sources*	*Others*
Born from the Earth (Autochthonous)	2.1151 ff., 5.795 ff.; Epicurus fr. 333 Us. (Censorinus *De Die Nat.* 4.9).	Hom. *Il.* 2.457; Empedocles DK31 B35, B57, B59, B61, B62, B96; Aesch. *Suppl.* 250–1; Asius (Paus. 8.1.4); Eur. *Phoin.* 638 ff.; Pl. *Menex.* 237d–238a, and *Plt.* 269a–274e, Panathenaicus 124–5; Diod. Sic. 1.7; Zeno of Citium (Censorinus *De Die Nat.* 4.10).
Born by Spontaneous Generation	5.795 ff., Epicurus fr. 333 Us.	Anaximander DK12 A30; ?Pythagoras DK58 C6; Anaxagoras DK59 A1; Archelaus DK60 A4; Democritus DK68 A139 (Lactant. *Inst. Div.* 7.7.9; Censorinus *De Die Nat.* 4.9); Diod. Sic. 1.7.
Present-Day Spontaneous Generation	2.871–3, 2.898–901, 2.926–9, 3.719–21, 5.797 ff.	Arist. *Metaph.* 1032^a12–$^b1$, *Hist. An.* 551^a1–552^b25, and 569^a11–570^a23, *Gen. An.* 762^a8–34; Theophr. fr. 174 Wimmer; Diod. Sic. 1.10.2; Verg. *G.* 4.281–314; Ov. *Met.* 1.42 ff. and 15.363 ff.; Nic. *Ther.* 741; Pliny *NH* 9.99; Sext. Emp. *Pyrrh.* 1.41; August. *C. Faustum* 6.8; Origen *C. Celsum* 1.37.22 ff.

Humans (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
Born from Earth, Water, and Heat	5.795 ff., Epicurus fr. 333 Us.	Anaximander DK12 A30; Empedocles DK31 B71; Xenophanes DK21 B27, B29, B33; Pythagoras DK58 C6; Diod. Sic. 1.7.
Moulded by Prometheus from Earth and Water	—	Heraclides Ponticus fr. 66 Wehrli; Philemon fr. 89 Kock; Callim. fr. 192.3 Pfeiffer; Apollodorus 1.7.1; Ov. *Met.* 1.80–3; Lucian *Prometheus* 11–17; Paus. 10.4.4.
Moulded by Zeus or Other Gods from Earth, Water, and/or Heat	—	Hes. *Theog.* 570–612 and *Op.* 59 ff.; Pl. *Tim.* 42e–43a and *Prt.* 320c ff.; Aristoph. *Av.* 686; Ov. *Met.* 1.78–9.
Born from Trees	—	Hom. *Od.* 19.163, *Il.* 22.126; Hes. *Op.* 145, Hes. fr. 205 M–W; Verg. *A.* 8.314 ff.; Ov. *Met.* 7.614 ff.; Strabo 8.6.16; Apollodorus 3.12.6; Paus. 2.29.2; Stat. *Theb.* 275 ff.
Born from Stones	—	Hom. *Od.* 19.163, *Il.* 22.126; Hes. fr. 234 M–W; Pind. *O.* 9.43; Pl. *Crit.* 112a and *Tim.* 22a; Arist. *Mete.* 352^{a}32; Ov. *Met.* 1.411 ff.
Born inside 'Fish-Like Creatures'/ 'Spiny Barks'	—	Anaximander DK12 A30.
Born from the Remains of the Titans	—	Olympiodorus fr. 220 Kern; Ov. *Met.* 157 ff.

Animals

Born from the Earth by Spontaneous Generation	5.795 ff: 2.1151 ff.	Pythagoras DK58 C6 (Porph. *Pythag.* 44); Empedocles DK31 B57, B59, and B61; Anaximander DK12 A30 (Censorinus *De Die Nat.* 4.7; Ps. Plut. *Strom.* 2; Hippol. *Ref.* 1.6.6; Plut. *Symp.* 8.730E; Aëtius 5.19.4.); Anaxagoras DK59 A1 (Diog. Laert. 2.9); Archelaus DK60 A4; Democritus DK68 A139 (Lactant. *Inst. Div.* 7.7.9; Censorinus *De Die Nat.* 4.9); Pl. *Menex.* 237d–238a; Diod. Sic. 1.7.
Created by Gods	—	Pl. *Prt.* 320c ff.; Genesis 1: 20–5 and 2: 19.
Fallen from Sky	—	Anaxagoras DK59 A113; Epimenides DK3 B2.
Formed by Metamorphosis from Humans	—	Pl. *Tim.* 91d ff.; Ov. *Met.* *passim*, e.g. 2.367–80, 5.300–1, 5.674, 7.371–2, 10. 207, 12.144–5, and 13.396.

Adaptation and Evolution

Theme	*DRN/Epicurean Sources*	*Others*
Adaptation by Extinctions	5.837 ff.	Empedocles DK31 B61 (with Arist. *Phys.* 2.8, 198^{b}16–32; Simpl. *in Phys. CAG* 9.371.33–372.11); Hippoc. *De Vet. Med.* 3.26.
Adaptation by Extinctions of Non-Viable Creatures	5.837 ff.	Empedocles DK31 B61 (with Arist. *Phys.* 2.8, 198^{b}16–32; Simpl. *in Phys. CAG* 9.371.33–372.11).
Adaptation by Extinctions of Viable Creatures in a Struggle for Life	5.855 ff.	Hippoc. *De Vet. Med.* 3.26.
Inheritance of Acquired Characters	5.1011–27.	Empedocles DK31 B97; Pl. *Tim.* 91d ff.; Arist. *Gen. An.* 721^{b}18 ff.; Hippoc. *Airs, Waters Places* 14.
Pangenetic Theory of Embryology	4.1037 ff., 5.851 ff.	Empedocles (ap. Arist. *Gen. An.* 722^{b}17–30); Hippoc. *Nat. Puer.* 17 (vii.496.19–20), *Airs, Waters, Places* 14.
Species Fixity[a]	2.661 ff., 2.700 ff., 5.923–4.	Anaximander DK12 A30; ?Pythagoras DK58 C6; Empedocles DK31 B57, B59, B61, B62, B71; Anaxagoras DK59 A1 (Diog. Laert. 2.9; Hippol. *Ref.* 1.8.12); Archelaus DK60 A4; Pl. *Prt.* 320c ff.; Genesis 1: 21 and 2: 19.

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[a] I assume that if a writer has humans/animals appearing originally in their present form, then the idea of the fixity of species is present, whether or not it is mentioned.

Intra-Species Evolution	5.1011–27.	Archelaus DK60 A4; Hippoc. *Airs, Waters, Places* 14; Ov. *Ars Am.* 2.473 ff.
Inter-Species Evolution	—	Pl. *Tim.* 91d ff.; Ov. *Met. passim*, e.g. 2.367–80, 5.300–1, 5.674, 7.371–2, 10.207, 12.144–5, and 13.396.
Human Physiological Evolution from the Bestial towards the Human	5.1011–27.	?Empedocles DK31 B62; ?Archelaus DK60 A4; Ov. *Ars Am.* 2.473 ff.; Macrob. *Somn. Scip.* 2.10.6.
Human Psychological Evolution from the Bestial towards the Human	5.1011–27.	Archelaus DK60 A4; Ov. *Ars Am.* 2.473 ff.; Manilius *Astron.* 1.79 ff.; Macrob. *Somn. Scip.* 2.10.6.
Humans are Animals	5.925 ff., Epicurus fr. 333 Us. (Censorinus *De Die Nat.* 4.9).	Anaximander DK12 A30; Empedocles DK31 B71; Xenophanes DK21 B27, B29, B33; Archelaus DK60 A4; Anaxagoras DK59 A1; Pythagoras DK58 C6; Democritus DK68 A139; Diod. Sic. 1.7 (see Blundell, 1986, 79 ff.).

APPENDIX B

Table of Themes in Prehistories and Accounts of the Golden Age (including Isles of the Blessed, Ideal States, Noble Savages, etc.)

THIS table is intended to represent an outline of the *Bildungsgut* of prehistory. I have not restricted it to descriptions of the past alone, and I include blessed lands, both past, present, and future, since there is often no clear conceptual boundary between them. The table may serve both as a guide to the vast mass of literature on the subject, and also, I hope, to illustrate the universality of certain of L.'s themes, and how they often appear in widely differing contexts. Please note that the table is by no means exhaustive, even for ancient Greek and Roman sources. Medieval and later entries are merely representative.

— indicates the theme does not appear in *DRN* or the other extant Epicurean sources.

Entries preceded by ? indicate that the theme is not definitely present, or that the writer gives the theme in an ambiguous way.

Compiled from Gatz, 1967; L&B; Boas; and Cole, 1990, with many omissions and additions.

Linked Themes

Theme	*DRN/Epicurean Sources*	*Others*
Invention of Property, Metals, Agriculture, and Seafaring linked (in various combinations) with Warfare, Injustice, and Moral Decline	5.1110–16, 1241–9, ?1266–8, 1289–96, ?1350–60.	Hes. *Op.* 156 ff.; Empedocles DK31 B128; Pl. *Tim.* 24, *Crit.* 120e ff.; Dicearchus fr. 49 Wehrli; Aratus *Phaen.* 109 ff.; Agatharchides *De Mar. Eryth.* 49; Verg. *Ecl.* 4.31 ff., *G.* 1.254 ff., 2.490 ff., *A.* 8.314 ff.; Tibull. 1.3.49 ff., 2.3.35 ff.; Hor. *Epod.* 16.40 ff.; Ov. *Met.* 1.128 ff., 15.96 ff., *Am.* 3.8.25 ff.; Manilius *Astron.* 1.75 ff.; Sen. *Ep.* 90 (Posidonius fr. 284 E–K); Ps. Sen. *Oct.* 388 ff.; Hyg. *Poet. Astron.* 2.25; Maximus Tyrius *Diss.* 36; Rousseau *2nd Discourse* pt. 2.

Early/'Primitive' Humans, 'Noble Savages', etc.

Larger/Tougher/ Hairier/Beast-like	5.925–30, 966, 970.	Hom. *Il.* 1.260 ff., 5.303, 12.381–3; Hes. *Op.* 143 ff.; Hdt. 1.68; Verg. *G.* 1.63, *A.* 12.899–900; Ov. *Met.* 1.414–15, *Ars Am.* 2.473 ff.; Pliny *NH* 6.30, 7.15; 1 Cor. 15: 47–9; Gell. *NA* 3.10; August. *Civ. Dei* 15.9; Ps. Clementina *Homilia* 8.10–17; Rousseau *2nd Discourse* pt. 1.

Early/'Primitive' Humans, 'Noble Savages', etc. (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
Taller/More Beautiful/Physically Superior	—	Hom. *Il.* 1.260 ff.; Hdt. 3.20; Scylax *Periplus* 112; Philo *De Op. Mund.* 47–9; Pliny *NH* 6.30; Columbus *Ep. ad Luis de S. Angel* (Jane 1.6); De Léry *Histoire* ch. 8.
Longer-Lived	?5.931–2.	Genesis 5: 3 ff.; Hes. *Op.* 109 ff.; Pind. *P.* 10.29 ff.; Ctesias *Indica* 23; Callim. *Hymn to Delos* 282; P. Mela *Chor.* 3.36–7; Pliny *NH* 4.89; August. *Civ. Dei* 15.9; Junior Philos. *Tot. Orb. Descr.* 4–7; Geoffrey of Monmouth *Vit. Merl.* 908–15; Vespucci *Mundus Novus*; Montaigne *Cannibals* 1.31; De Léry *Histoire* ch. 8.
Healthier	5.930.	Hes. *Op.* 90 ff.; Pind. fr. 143 Snell and *P.* 10.29 ff.; Telekleides fr. 1 Edmonds; *Vayu Purana* 8.47 ff.; Dicearchus fr. 49 Wehrli; *Orac. Sib.* 1.283 ff.; Pliny *NH* 4.89; Theopomp. FGH 115 fr. 75 CJ; Solinus *Collect.* 26; Lactant. *De Ave Phoen.* 1–28; August. *Civ. Dei* 14.26; Junior Philos. *Tot. Orb. Descr.* 4–7; Hildegard of Bingen *Caus. et Cur.* 2; Montaigne *Cannibals* 1.31; De Léry *Histoire* ch. 8.

Morally Superior	5.1009–10.	Genesis 1–2; Hom. *Il.* 1.23–4, 13.1–6; Hes. *Op.* 109 ff.; Pl. *Leg.* 3.676 ff.; Dicearchus fr. 49 Wehrli; Aratus *Phaen.* 96 ff.; Tibull. 1.3.35 ff.; Ov. *Met.* 1.89 ff., 15.96 ff.; P. Trogus (Justinus *Epit.* 43.1.3–4); Ps. Sen. *Oct.* 388 ff.; Hyg. *Poet. Astron.* 2.25; Ps. Callisthenes *Gesta Alex.* 3.9–14; Junior Philos. *Tot. Orb. Descr.* 4–7; Montaigne *Cannibals* 1.31; Pope *Essay on Man* 3.161 ff.
Morally Inferior	5.958–61, 2.1157–9.	Hom. *Il.* 9.106 ff.; Eur. *Suppl.* 210 ff.; Critias *Sisyphus TrGF* 1.43 fr. 19; Pl. *Prt.* 320c ff.; Moschion *TrGF* 1.97 fr. 6; Athenio *PCG* fr. 1; Hor. *Sat.* 1.3.99 ff.; Grat. Fal. *Cyn.* 2 ff.
θηριώδης βίος/ *Vita more ferarum*	5.931–2, Philodem. *De Piet.* 1215 Obbink.	Eur. *Suppl.* 195 ff., *Orest.* 1646; Critias *Sisyphus TrGF* 1.43 fr. 19; Hippoc. *De Vet. Med.* 3.26; Isoc. *Or.* 3.6, 4.28, 4.39; Dicearchus fr. 49 Wehrli; Moschion *TrGF* 1.97 fr. 6; Polyb. 6.5.4 ff.; Diod. Sic. 1.8.1 and 1.90.1; Cic. *Inv.* 1.2, *Rep.* 1.25.40; Vitruv. *De Arch.* 2.1.1 ff.; Verg. *A.* 8.314 ff.; Hor. *Ars* 391 ff., *Sat.* 1.3.99 ff.; Tibull. 2.1.37 ff.; Ov. *Am.* 3.10.7 ff., *Ars Am.* 2.621 ff., 3.113 ff., 2.289 ff.; Manilius *Astron.* 1.66 ff.; Pliny *NH* 16.1;

Early/'Primitive' Humans, 'Noble Savages', etc. (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
		Plut. *Adv. Col.* 30, *De Is. et Os.* 13; Tac. *Ann.* 3.26; Apul. *Apol.* 23; Minuc. Fel. *Oct.* 21.4 ff.; Lactant. *Inst. Epit.* 17; Prudent. *C. Symm.* 2.277 ff.; Macrob. *Somn. Scip.* 2.10.6, *Saturn.* 1.7; Claudian *Rapt. Pros.* 3.18 ff.; Columbus *Ep. ad Doña Juana* (Jane 2.66), Rousseau *2nd Discourse* pt. 1.
Naked	5.971.	Genesis 2: 25; Diod. Sic. 1.8.5; Columbus *Ep. ad Luis de S. Angel* (Jane 1.6); Vespucci *Mundus Novus*; Montaigne *Cannibals* 1.31; De Léry *Histoire* ch. 8; Rousseau *2nd Discourse* pt. 1.
Living in Fields/ Mountains/Forests/ Caves	5.939, 946, 948, 955–7, 962, ?972, 992, ?1243–5, ?1284, 1386, 1411, D. of O. fr. 12 Smith.	Hom. *Hymn Heph.* 1 ff.; Aesch. *PV* 447 ff.; Isoc. *Or.* 4.39 f.; Pl. *Leg.* 3.676 ff., *Prt.* 320d ff., *Tim.* 22c ff., Moschion *TrGF* 1.97 fr. 6; Diod. Sic. 1.8.7, 3.56.3 ff.; Cic. *De Orat.* 1.36, *Sest.* 91, *Tusc.* 1.62, 5.5, *Rep.* 1.25.40; Vitruv. *De Arch.* 2.1.1 ff.; Hor. *Ars* 391 ff.; Ov. *Met.* 1.121–2, *Ars Am.* 2.467 ff., 2.621 ff., *Fast.* 2.289 ff.; Sen. *Ep.* 90 (Posidonius fr. 284 E–K), *Phaedr.* 525 ff.; Juv. *Sat.*

		6.1 ff.; Lucian *Amat.* 33 f.; Claudian *Rapt. Pros.* 3.18 ff.; Columbus *Ep. ad Doña Juana* (Jane 2.66); Rousseau *2nd Discourse* pt. 1.
In Harmony with Wild Animals	—	Empedocles DK31 B130; Ov. *Met.* 15.96 ff.; Verg. *Ecl.* 4.21 ff.; Lactant. *Div. Inst.* 7.24.
In Conflict with Wild Animals	5.982–7.	Pl. *Prt.* 320c ff.; Dicearchus fr. 49 Wehrli; Hermarchus fr. 34 LA; Cic. *Rep.* 1.25.40; Diod. Sic. 1.8.2; Sen. *Ep.* 90 (Posidonius fr. 284 E–K); Prudent. *C. Symm.* 2.277 ff.; Rousseau *2nd Discourse* pt. 1.
Vegetarian/Wild/Raw Diet	5.939–41, 965, 1416.	Genesis 1: 29; Empedocles DK31 B128; Hellanicus fr. 96; Hippoc. *De Vet. Med* 3.26; Dicearchus fr. 49 Wehrli; Diod. Sic. 1.8.1, 1.8.6; Ov. *Met.* 1.104 ff., 15.96 ff.; Tert. *De Jej.* 4; Ps. Callisthenes *Gesta Alex.* 3.9–14; Novat. *De Cib. Jud.* 2; St Basil *De Struct. Hom.* 2.3.4; Alex. Neckham *De Nat. Rer.* 2.156; Rousseau *2nd Discourse* pt. 1.
Food: Spontaneously Produced/Abundant	2.1157–9, 3.18–24, 5.811–15, 937–8, 942–4.	Genesis 1: 29–30; Hom. *Od.* 9.106 ff.; Hes. *Op.* 109 ff.; *Vayu Purana* 8.47 ff.; Empedocles DK31 B77–8; Aesch. fr. 196 Nauck; Hdt. 4.95; Pl. *Plt.* 271 ff., *Crit.* 114d ff.;

Early/'Primitive' Humans, 'Noble Savages', etc. (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
		Arist. Protrept. fr. 58 Rose; Dicearchus fr. 49 Wehrli; Moschion *TrGF* 1.97 fr. 6; Arat. *Phaen.* 96 ff.; Diod. Sic. 1.8.1–2, 2.47.1, 2.55–60, 5.19, 5.41–6; Varro *LL* 5.108, *RR* 2.1.3; Verg. *Ecl.* 4, *G.* 1.121 ff., 2.458 ff.; Strabo 15.1.34; Hor. *Epod.* 16, *Carm.* 3.24.9 ff.; Tibull. 1.3.35 ff.; Ov. *Met.* 1.111–12, 15.96 ff., *Am.* 3.8.35, *Fast.* 4.395 ff., *Trist.* 3.12.1 ff.; Dion. Hal. 1.36, *Aetna* 9–16; German. *Arat.* 103 ff.; Ps. Sen. *Oct.* 385 ff.; Sen. *Ep.* 90 (Posidonius fr. 284 E–K), *Phaedr.* 525 ff.; Plut. *Sert.* 8; Lucian *Saturn.* 5–9, 20, *V. Hist.* 1.28; Fronto *Laud. Negl.* p. 204 Hout; Maximus Tyrius *Or.* 21.5C; *Orac. Sib.* 1.283 ff. and 3.741 ff.; Ps. Callisthenes *Gesta Alex.* 3.9–14; Lactant. *Div. Inst.* 7.24.7 ff.; Claudian *Rapt. Pros.* 3.18 ff., 23.5B, 36.1 f.; Philostrat. *Imag.* 2.18.1; Symm. *Or.* 3.9; Avitus *De Mund. Init.* 193 ff.; Ambrose *Hexaemeron* 3.10; Prudent. *C. Symm.* 2.277 ff.; Benedeit *Navigio Sanct. Brend.*; Anon. *Letter of Prester*

	John 21; Geoffrey of Monmouth *Vit. Merl.* 908–15; Montaigne *Cannibals* 1.31; Rousseau *2nd Discourse* pt. 1.
?5.944.	Hippoc. *De Vet. Med.* 3.26; Diod. Sic. 1.8.1, 1.43; Cic. *Inv.* 1.2; Vitruv. *De Arch.* 2.1.1 ff.; Verg. *A.* 8.314 ff.; Ov. *Met.* 15.96 ff., *Am.* 3.10.7 ff., *Ars Am.* 2.467 ff., *Fast.* 2.289 ff., 4.395 ff.; Paus. 8.1.4–6; Lucian *Amat.* 23 ff.; Iustinus *Epit. P. Trog.* 44.4.
5.939, 965, 1416.	Hes. *Op.* 233; Hdt. 1.66.2; Hellan. fr. 96; Theophr. fr. 2.25 ff.; Dicearchus fr. 49 Wehrli; Galen *De Alim. Fac.* 2.38.4; Diod. Sic. 19.19.3; Cic. *Orat.* 31; Varro *RR* 2.1.3; Verg. *G.* 1.8, 1.147–9; Hor. *Sat.* 1.3.100; Tibull. 2.1.37 ff., 2.3.68 ff.; Diosc. 1.175; Prop. 3.13.25 ff.; Ov. *Met.* 1.104–6, 14.216, *Am.* 3.10.9, *Ars Am.* 2.622, *Fast.* 1.671 ff., 4.395 ff., 4.509 ff.; Pliny *NH* 7.56, 16.1, 16.6; Plut. *Mor.* 993 E ff., *Cor.* 3.3–4; Juv. *Sat.* 6.1 ff., 13.57; Lucian *Amat.* 33 f.; Paus. 8.1.4–6, 8.5.1; Apul. *Met.* 11.2; Macrob. *Somn. Scip.* 2.10.6; Max. Tyr. *Or.* 21.5c; Ap. Rhod. 4.264 ff.; Aelian *Var. Hist.* 3.39; Prudent. *C. Symm.* 2.284; Claudian *Rapt. Pros.* 3.18 ff.; Boethius *Phil. Cons.* 2.5; Arnob. *Nat.* 2.66; Calpurnius *Ecl.* 4.24; Just. 2.6.5; Cervantes *DQ* 1.11; Rousseau *2nd Discourse* pt. 1; Locke 2nd *Tr. Govt.* ch. 5; Mary Shelley *Frankenstein* ch. 17.

Early/'Primitive' Humans, 'Noble Savages', etc. (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
Arbute Berries	5.941, 965.	Varro *RR* 2.1.4 (Dicearchus?); Verg. *G.* 1.148; Ov. *Met.* 1.104.
Carnivorous/Hunting	5.966–9, 1249, Diog. of O. fr. 12 Smith, Hermarc. fr. 34 LA.	Genesis 9: 3–4; Pl. *Leg.* 3.676 ff.; Dicearchus fr. 49 Wehrli; Tert. *De Jej.* 4; Nov. *De Cib. Jud.* 2; Montaigne *Cannibals* 1.31; Rousseau *2nd Discourse* pt. 1; De Léry *Histoire* ch. 10.
Cannibalism	—	Hom. *Od.* 9.106 ff.; Orphica fr. 292 Kern; Pl. *Leg.* 3.782c1 ff. and *Plt.* 271 ff.; Athenio *PCG* fr. 1; Moschion *TrGF* 1.97 fr. 6; Diod. Sic. 1.13; Strabo 7.3.9; Montaigne *Cannibals*; De Léry *Histoire* ch. 15.
Rivers of Plenty	— (cf. 5.911 ff.).	Exodus 3: 8, 13: 5; Eur. *Bacch.* 704 ff., *Hipp.* 741 ff.; Pherecrates *PCG* fr. 113; Pl. *Ion* 534a, *Rep.* 363a6 ff.; Theocr. 5.124 ff.; Verg. *G.* 1.132, 2.136–8, *Ecl.* 4, 15.1.64; Tibull. 1.3.35 ff.; *Aetna* 9 ff.; Hor. *Carm.* 1.33.7 f., 2.19.9 ff., *Epod.* 16; Ov. *Met.* 1.111–12, *Am.* 3.8.35 ff.; Stat. *Silv.* 1.6.39 ff.; Lucian *V. Hist.* 1.7, 2.6, 2.11–14; *Orac. Sib.* 3.741 ff.; Philostrat. *Imag.* 1.14.3, 1.18.1; Lactant. *Div. Inst.* 7.24;

		Claudian *Rapt. Pros.* 3.18 ff.; Junior Phil. *Tot. Orb. Descr.* 4–7; Benedeit *Navigio Sanct. Brend.*; Anon. *Letter of Prester John* 21; Columbus *Ep. ad Luis de S. Angel* (Jane 1.6).
Magical Fountains/Springs etc.	— (cf. 5.911 ff.).	Ctesias *Ind.* (Photius *Cod.* 72 45b); Lucian *V. Hist.* 1.7, 2.6, 2.11–14; Ps. Lactant. *De Ave Phoen.* 1–28; Anon. *Letter of Prester John* 21; Pater Marcus *Visio Tnudgali*; Roger de Wendover *De Parad.*
Scarcity of Food/Starvation	5.1107.	Pl. *Rep.* 369c; Aristoph. *Plut.* 468 ff., 510 ff., 532 ff.; Eratos. *Merc.* fr. 10.11 Hiller; Dicearchus fr. 49 Wehrli; Verg. *G.* 1.121 ff.; Diod. Sic. 1.8.6–7; Origen *C. Cels.* 4.76; Polyb. 6.5.4 ff.; (Theocritus) *Piscat.* 1 ff.; Nemesius of Emesa *De Nat. Hom.* 18 ff.; Apul. *Apol.* 18; Claudian *Rapt. Pros.* 3.18 ff.

Arts and Technologies

No Seafaring	5.1000–6.	Hom. *Od.* 9.106 ff.; Hes. *Op.* 109 ff.; Pl. *Leg.* 3.678c; Aratus *Phaen.* 96 ff.; Agatharchides *De Mar. Eryth.* 49; Posidonius fr. 284 E–K (Sen. *Ep.* 90); Verg. *Ecl.* 4.31 ff., *G.* 1.121 ff.; Hor. *Epod.* 2.1 ff., 16; Ov. *Met.*

Arts and Technologies (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
		1.94–6, *Fast.* 1.35 ff., *Am.* 3.8.35; Prop. 3.7.31 ff.; Tibull. 1.3.35 ff., 2.3.33 ff.; Manilius *Astron.* 1.66 ff.; German. *Arat.* 103 ff.; Sen. *Phaedr.* 525 ff., *Medea* 301 ff.; Hyg. *Poet. Astron.* 25; Boethius *Phil. Cons.* 2.5.
No Warfare/Conflict	5.999–1000.	Hes. *Op.*109 ff.; Pind. *P* 10.29 ff.; Empedocles DK31 B128, B130; Pl. *Plt.* 271 ff., *Leg.* 3.679a ff.; Agatharchides *De Mar. Eryth.* 49; Dicearchus fr. 49 Wehrli; Aratus *Phaen.* 96 ff.; Verg. *G.* 1.121 ff., 2.536 ff., *Ecl.* 4.17, 4.33; Hor. *Epod.* 2.1 ff.; Tibull. 1.3.35 ff.; Ov. *Met.* 1.97–100, 15.96 ff., *Fast.* 1.247; Posidonius fr. 284 E–K (Sen. *Ep.* 90); Sen. *Phaedr.* 525 ff.; German. *Arat.* 103 ff.; Ps. Callisthenes *Gesta Alex.* 3.9–14; Diog. Oin. fr. 56 Smith; Hyg. *Astron.* 25; P. Mela *Chor.* 3.36 ff.; *Orac. Sib.* 3.741 ff.; Ps. Sen. *Oct.* 385 ff.; Strabo 7.3.9; Boethius *Phil. Cons.* 2.5; Rousseau *2nd Discourse* pt. 1; Sir R. Blackmore *Creation* 3.17.

Warfare/Conflict	?5.1245–6, ?1283–5.	Critias *Sisyphus TrGF* 1.43 fr. 19; Arist. *Pol.* 1.1256^{b}23–6; Moschion *TrGF* 1.97 fr. 6; Hor. *Carm.* 1.3.99 ff.; Grat. Fal. *Cyn.* 2 ff.; De Léry *Histoire* ch. 14.
No Agriculture	5.933–6.	?Genesis 2: 5; Hom. *Od.* 9.106 ff.; Hes. *Op.* 109 ff.; Dicearchus fr. 49 Wehrli; Moschion *TrGF* 1.97 fr. 6; Caes. *B. Gall.* 6.22; Diod. Sic. 1.8.4; Varro *RR* 1.2.16, 2.1.3 ff.; Verg. *Ecl.* 4.40 ff., *G.* 1.125 ff., *A.* 8.314 ff.; Tibull. 1.3.35 ff.; Ov. *Met.* 1.101–2, 15.96 ff., *Am.* 3.8.35 ff., 3.10.1 ff.; Sen. *Phaed.* 535 ff.; Stat. *Theb.* 4.275 ff.; Ps. Sen. *Oct.* 418 ff.; Lucian *Sat.* 1.20.402 ff.; Philo *De Op. Mund.* 26; Prudent. *C. Symm.* 2.277 ff.; Peter Abelard *Expos. In Hexaemeron* (on Genesis 2: 5); Rousseau *2nd Discourse* pt. 1.
No Land Boundaries	5.1110.	Verg. *G.* 1.125 ff.; Tibull. 1.3.35 ff.; Ov. *Met.* 1.135, *Am.* 3.8.35; Sen. *Phaedr.* 528 ff.; Ambrose *Expos. In Psalm. 118*, 22; De Léry *Histoire* ch. 18; Rousseau *2nd Discourse* pt. 2.
No Property/ Communism	5.1113.	Aristoph. *Eccl.* 590 ff.; Pl. *Leg.* 3.676 ff., 4.739c; Dicearchus fr. 49 Wehrli; Ps. Scymnus *Orb. Descr.* 850 ff.; Caes. *B. Gall.*

Arts and Technologies (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
		6.22; Cic. *De Offic.* 1.67.21; Diod. Sic. 5.41–6; Verg. *G.* 1.121 ff.; Tibull. 1.3.35 ff.; Strabo 7.3.9; Ov. *Met.* 1.135, *Am.* 3.8.35 ff.; German. *Arat.* 103 ff.; Juv. *Sat.* 6.1 ff.; Macrob. *Saturn.* 1.8; Max. Tyr. *Or.* 36.1 ff.; Sen. *Phaedr.* 525 ff., *Ep.* 90 (Posidonius fr. 284 E–K); Ps. Sen. *Oct.* 385 ff.; Philo *Quod Omnis Probus* 12; Ps. Callisthenes *Gesta Alex.* 3.9–14; Solinus *Collect.* App. 22.12–15; Ambrose *Expos. In Psalm. 118*, 22; Rousseau *2nd Discourse* pt. 1.
No Marriage/ Promiscuity, Community of Wives	5.962–5 (cf. 1011–13).	Pl. *Plt.* 273d ff.; Diogenes Cyn. *Rep.* (Diog. Laert. 6.72); Zeno *Rep.* (Diog. Laert. 7.33–4); Chrysippus (Sext. Emp. *Hyp.* 3.205); Strabo 7.303; Tibull. 2.3.35 ff.; Stat. *Theb.* 4.279; Rousseau *2nd Discourse* pt. 1.
No Laws	5.958–9.	Hom. *Od.* 9.106 ff.; Critias *Sisyphus TrGF* 1.43 fr. 19; Pl. *Plt.* 273d ff., *Leg.* 3.679b ff., *Prt.* 320c ff.; Agatharchides *De Mar. Eryth.* 49; Diod. Sic. 1.8.1; Verg. *A.* 8.314 ff.;

		Ov. *Met.* 1.90–3; P. Trogus (in Justin *Hist. Phil. Epit.* 1.1.1–3 and 2.2); Tac. *Ann.* 3.26; Ambrose *Epist. Class.* 2.73.2–3; Junior Philos. *Tot. Orb. Descr.* 4–7; De Léry *Histoire* ch. 8.

Discoveries and Inventions
Granted divinely/with divine aid/by *Nomothetes*/etc.

Arts and Technologies Generally	—	*Hom. Hymn Heph.* 1 ff.; Hes. *Op.* 42 ff.; Aesch. *PV* 447 ff.; Eur. *Suppl.* 195 ff.; Pl. *Prt.* 320d ff., *Plt.* 274c–d, *Laws* 4.713c–714a, *Menex.* 237e ff.; Moschion *TrGF* 1.97 fr. 6; Diod. Sic. 1.15.9 ff., 3.56.3 f.; Verg. *G.* 1.121 ff., *A.* 8.314 ff.; Pliny *NH* 7.57; Sen. *Med.* 301 ff.; Minuc. Fel. *Oct.* 21.4 ff.; Claudian *Rapt. Pros.* 3.18 ff.
Agriculture/Grain	—	Genesis 2: 15 and 3: 17 ff.; Hes. *Op.* 42 ff.; Eur. *Suppl.* 205; Isoc. *Or.* 4.28; Moschion *TrGF* 1.97 fr. 6; Aratus *Phaen.* 96 ff.; Callim. *Hymn* 6.19 ff.; Diod. Sic. 1.13, 1.29.3, 5.2.4; Verg. *G.* 1.129 ff., *A.* 8.314 ff.; Ov. *Am.* 3.10.12 ff., *Fast.* 1.671 ff., 4.395 ff., *Met.* 5.341 ff.; Philo *De Op. Mund.* 26; Pliny *NH* 7.57, 7.191; Paus. 8.4.1; Hyg. *Astron.* 2.14; Origen *C. Cels.* 4.76; Novat. *De Cib. Jud.* 2; August. *De Gen. Ad Lit.* 8.8.9; Peter Abelard *Expos. In Hexaemeron.*

Discoveries and Inventions
Granted divinely/with divine aid/by *Nomothetes*/etc.
(*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
Fire	—	*Hom. Hymn Herm.* 3; Hes. *Op.* 50 ff., *Theog.* 535 ff.; Pl. *Prt.* 320c ff., *Plt.* 274c–d.
Language	—	?Genesis 1; Eur. *Suppl.* 201 ff.; Diod. Sic. 1.15.9 ff.; Macrobius *Saturn.* 1.7.
Justice and Law	—	Theognis *Eleg.* A. 1135 ff.; Pl. *Critias* 120e ff., *Prt.* 320c ff., *Leg.* 4.713c–714a, *Plt.* 273c–d; Aratus *Phaen.* 96 ff.; Cic. *In Verr.* 2.5.187; Diod. Sic. 1.14.3, 2.38.2 ff.; Verg. *A.* 8.314 ff.; Pliny *NH* 7.191; Plut. *De Is. et Os.* 13; Servius in Verg. *A.* 8.322.

Discoveries and Inventions
Discovered gradually/by chance and necessity/by human ingenuity/with 'Nature', 'Time', 'Necessity', or 'Experience' as teacher etc.

Arts and Technologies Generally	5.1440 ff.; Epicurus *Ep. Hdt.* 75–6; Diog. of O. fr. 12 Smith.	Xenophanes DK21 B18 (cf. B14, and B15); Anaxagoras DK59 A66, B21, and B4 (cf. A102); Archelaus DK60 A4 (cf. A1 and A2); Democritus DK68 B154 (cf. B144, A151, and A138); Hippoc. *De Vet. Med.* 3.26; Pl. *Leg.* 3.678a; Philemon (Stobaeus *Ecl.*

		1.8.34); Posidonius fr. 284 E–K (Seneca *Ep.* 90); Moschion *TrGF* 1.97 fr. 6; Cic. *Leg.* 1.8.26, *Sest.* 91–2; Vitruv. *De Arch.* 2.1; Varro *RR* 2.1.3 ff.; Diod. Sic. 1.8; Verg. *G.* 1.145–6; Hor. *Sat.* 1.3.99 ff.; Manilius *Astron.* 1.66 ff.; Pliny *NH* 7.57; Prudent. *C. Symm.* 2.277 ff.
Agriculture	5.1361 ff., 1448, 6.1 ff.	Anaxagoras DK59 B21 and B4; Soph. *Antig.* 332 ff.; Hippoc. *De Vet. Med.* 3.26; Pl. *Leg.* 3.676 ff.; Moschion *TrGF* 1.97 fr. 6; Cic. *Flacc.* 62, *Tusc.* 1.62; Diod. Sic. 1.8; Manilius *Astron.* 1.66 ff.; Posidonius fr. 284 E–K (Sen. *Ep.* 90).
Fire	5.1011, 1091–1101.	Democritus (Diog. Laert. 9.47); Diod. Sic. 1.8; Vitruv. *De Arch.* 2.1; Verg. *G.* 1.135; Rousseau *2nd Discourse* pt. 2.
Language	5.1028 ff.; Epicurus *Ep. Hdt.* 75–6, *On Nature* 12, and 28; Diog. of O. fr. 12 Smith; Philodemus *De Piet.* (225–31, 510–60, Obbink); Demetrius Lacon col. 67.4–5 (Puglia), Origen *C. Cels.* 1.24 (fr. 334 Us.).	Democritus DK68 B26; Pl. *Prt.* 320c ff., *Crat.* 388e–390e; Diod. Sic. 1.8; Vitruv. *De Arch.* 2.1; Cic. *Rep.* 3.2.3; Hor. *Sat.* 1.3.99 ff.; Manilius *Astron.* 1.85; Proclus *In Plat. Crat.* 16, p. 7; Lactant. *Div. Inst.* 6.10.13–15.

Discoveries and Inventions

Discovered gradually/by chance and necessity/by human ingenuity/with 'Nature', 'Time', 'Necessity', or 'Experience' as teacher etc. (*contd.*)

Theme	*DRN/Epicurean Sources*	*Others*
Justice and Law	5.1011–27, 1141–50, 6.1ff.; Epicurus *On Nature* 12 (Phld. *De Piet*. 225–31 Obbink); *KΔ* 32, 33, 39, 40; Hermarchus fr. 34 LA; Phld. *De Piet*. 1176–1217, 2145–74 Obbink; Plut. *Adv. Col*. 1124D; Diog. of O. fr. 56 Smith.	Archelaus DK60 A1, A2, and A4; Democritus DK B259 (cf. B256, B257, B258, B261); Critias *Sisyphus TrGF* 1.43 fr. 19; Pl. *Leg*. 3.676 ff.; Moschion *TrGF* 1.97 fr. 6; Polyb. 6.4–6; Posidonius fr. 284 E–K (Sen. *Ep*. 90); Cic. *Sest*. 91–2.
Climate		
Eternal Spring/Mild	3.18–24, 5.800, ?802, 806, 816, 818–20, 943–4, ?1395–6.	Hom. *Od*. 4.561 ff., 6.42–6; Pind. *O*. 2.62 ff.; *Vayu Purana* 8.47 ff.; Ps. Pl. *Axioch*. 371; Diod. Sic. 2.47.1 ff., 2.55–60, 5.19; Strabo 1.1.4; Verg. *G*. 2.335 ff.; Hor. *Epod*. 16; Prop. 4.7.59 ff.; Ov. *Met*. 1.107; P. Mela *Chor*. 2.100; Pliny *NH* 4.58; Plut. *De Fac*. 26, *De Sera* 25, *Sert*. 8, 4.89, 6.55; Lucian *V. Hist*. 2.3–6; Max. Tyr. *Or*. 36.1 ff.; Commodian *Instr*. 2.3.3 ff.; Servius on Verg. *A*. 5.735; August. *Civ. Dei* 14.26; Claudian *Rapt*.

		Pros. 2.277 ff., *Epithal. De Nupt. Hon. Aug.* 49 ff.; Ps. Lactant. *De Ave Phoen.* 1–28; Avitus *De Mund. Init.* 193 ff.; Benedeit *Navigio Sanct. Brend.*; Henry of Saltrey *De Purgat. Sanct. Patric.* 56; Mart. Capella *Philol.* 6.693; De Léry *Histoire* ch. 8.
Storms and Cold	?5.929, ?940, 957, 1002–3, 1015–16, 1426–7, Diog. of O. fr. 12 Smith.	Posidonius fr. 284 E–K (Sen. *Ep.* 90); Diod. Sic. 1.8.6–7; Rousseau *2nd Discourse* pt. 1.

Bibliography

EDITIONS AND COMMENTARIES

Bailey, C. (1947), *Titi Lucreti Cari* De rerum natura *Libri Sex* (Oxford).

Bernays, J. (1857), *Titi Lucreti Cari* De rerum natura *Libri Sex* (Leipzig).

Brown, P. M. (1984), *Lucretius* De rerum natura *I* (Bristol).

——(1997), *Lucretius* De rerum natura *III* (Warminster).

Brown, R. D. (1987), *Lucretius on Love and Sex: A Commentary on* De rerum natura *IV, 1030–1287* Columbia Studies in the Classical Tradition, 15 (Leiden).

Costa, C. D. N. (1984), *Lucretius* De rerum natura *V* (Oxford).

Creech, T. (1695), *Titi Lucretii Cari* De rerum natura *libri sex: quibus interpretationem et notas addidit T. Creech* (Oxford).

Diels, H. (1923–4), *T. Lucreti Cari* De rerum natura *libri sex* (Berlin).

Duff, J. D. (1889), *T. Lucreti Cari* De rerum natura. *Liber quintus* (Cambridge).

Ernout, A., and L. Robin (1925–8), *Lucrèce,* De rervm natvra*: commentaire exégétique et critique* (Paris).

Faber, T. (1566), *Titi Lucretii Cari* De rerum natura *libri sex. Additæ sunt conjecturæ & emendationes Tan. Fabri, cum notulis perpetuis* (Saumur).

Ferandus, J. (1473), *Titi Lucreti Cari* De rerum natura *Libri Sex* (editio princeps, Brescia).

Fowler, P. G. (1983), 'A Commentary on Part of Book Six of Lucretius *De rerum natura* (6.1–95, 1090–1286)' (Diss., Oxford).

Giancotti, F. (1994), *Tito Lucrezio Caro* La natura (Milan).

Gifanius, O. (1566), *T. Lucretij Cari* De rerum natura *libri sex, in pristinum ab O. Gifanio restituti* (Antwerp).

Giussani, C. (1898), *Titi Lucreti Cari* De rerum natura *Libri Sex* (Turin).

——(1929), ed. E. Stampini, *T. Lucreti Cari* De rerum natura *libri sex* (Turin).

——and E. Stampini (1959), ed. V. Agostino, *Lucrezio* De rerum natura *Libro Quinto* (Turin).

Godwin, J. (1986), *Lucretius* De rerum natura *IV* (Warminster).

——(1991), *Lucretius* De rerum natura *VI* (Warminster).

KENNEY, E. J. (1971), *Lucretius* De rerum natura *Book 3* (Cambridge).

LACHMANN, K. (1850), *T. Lucreti Cari* De rerum natura *Libri Sex* (Berlin).

LAMBINUS, D. (1563), *Titi Lucretii Cari* De rerum natura *libri sex* (Paris and Leiden).

LEONARD, W. E., and S. B. SMITH (1942), *T. Lucreti Cari* De rerum natura *libri sex* (Madison, Wis.).

MARTIN, J. (1934), *T. Lucreti Cari* De rerum natura *libri sex* (Leipzig).

MARULLUS, M. (1512–13), ed. P. Candidus, *T. Lucretii Cari* De rerum natura *libri VI* (Juntine edn., Florence).

MERRILL, W. A. (1917), *Lucreti* De rerum natura *Libri Sex* (Berkeley).

——(1918), 'Criticisms of the Text of Lucretius with Suggestions for its Improvement', *University of California Publications in Philology*, 3.4, 1–133

MÜLLER, K. (1975), *T. Lucreti Cari* De rerum natura *libri sex* (Zurich).

MUNRO, H. A. J. (1864), *Titi Lucreti Cari* De rerum natura *Libri Sex* (Cambridge).

NAUGERIUS, A. (1515), *Lucretius* (Aldine edn., Venice).

PIUS, J. B. (1511), *In Caru Lucretiu poeta comẽtarij a Joane Baptista Pio editi* (Bologna).

SMITH, M. F. (1992), *Lucretius* On the Nature of Things (3rd edn., Loeb, Cambridge, Mass.).

WAKEFIELD, G. (1797), *T. Lucretii Cari* De rerum natura *libri sex* (London).

WATSON, J. S. (1882), *Lucretius* On the Nature of Things (London).

REFERENCES

ADAMS, J. (1982*a*), *The Latin Sexual Vocabulary* (London).

——(1994), 'Wackernagel's Law and the Position of Unstressed Personal Pronouns in Classical Latin', *Transactions of the Philological Society*, 92.2, 103–78.

AJOOTIAN, A. (1997), 'The Only Happy Couple: Hermaphroditus and Gender', in A. Koloski-Ostrow and C. Lyons (eds.), *Naked Truths: Women, Sexuality, and Gender in Classical Art and Archaeology* (London), 220–42.

ALBERTI, A. (1995), 'The Epicurean Theory of Law and Justice', in Laks and Schofield, 1995, 161–90.

ALFONSI, L. (1968), 'Tra Euripide e Lucrezio', *Hermes*, 96, 118–21.

ALGRA, K. (1997), 'Lucretius and the Epicurean Other', in Algra, Koenen, and Schrijvers, 1997, 141–50.

—— KOENEN, M., and P. H. SCHRIJVERS (eds.) (1997), *Lucretius and his Intellectual Background* (Amsterdam and Oxford).

ALLEN, A. (1996), 'Lucretius 5.948', *Classical Quarterly*, NS 46, 304–5.

ALLEN, J. (2001), *Inference from Signs: Ancient Debates about the Nature of Evidence* (Oxford).

ALLEN, T. W., HALLIDAY, W. R., and E. E. SIKES (eds.) (1936), *The Homeric Hymns* (Oxford).

AMORY, A. (1969), '*Obscura de re Lucida Carmina*: Science and Poetry in Lucretius' *DRN*', *Yale Classical Studies*, 21, 145–68.

ARENS, J. C. (1950), '*-Fer* and *-Ger*, their Extraordinary Preponderance among Compounds in Roman Poetry', *Mnemosyne*, 4.3, 241–62.

ASMIS, E. (1982), 'Lucretius' Venus and Stoic Zeus', *Hermes*, 110, 458–70.

—— (1983), 'Reason and Rhetoric in Lucretius', *American Journal of Philology*, 104, 36–66.

——(1984), *Epicurus' Scientific Method* (Ithaca).

——(1995), 'Epicurean Poetics', in Obbink (ed.), *Philodemus and Poetry*, 15–34.

——(1996), 'Lucretius on the Growth of Ideas', in Giannantoni and Gigante, 1996, 763–78.

Association Guillaume Budé (1969), *Actes du VIII^e Congrès* (Paris).

ATHERTON, C. (ed.) (1998), *Form and Content in Didactic Poetry*, Proceedings of the 5th Nottingham Classical Literature Symposium (Nottingham and Bari).

AUSTIN, R. G. (1977), *P. Vergili Maronis Aeneidos Liber Sextus* (Oxford).

AXELROD, R. (1984), *The Evolution of Co-operation* (New York).

——(2000), 'On Six Advances in Cooperation Theory', *Analyse und Kritik*, 22 (July), 130–51, available online at http://www.pscs.umich.edu/pub/papers/OnSixAdvancesinCoopTheory.pdf

BADCOCK, C. (1994), *PsychoDarwinism: The New Synthesis of Darwin and Freud* (London).

BAILEY, C. (1926), *Epicurus: The Extant Remains* (Oxford).

——(1928), *The Greek Atomists and Epicurus* (Oxford).

——(1947), *Titi Lucreti Cari* De rerum natura *Libri Sex* (Oxford).

BALDRY, H. C. (1952), 'Who Invented the Golden Age?', *Classical Quarterly*, NS 2, 83–92.

BALME, D. (1985), 'Aristotle *Historia Animalium* Book Ten', in J. Wiesner (ed.), *Aristoteles und seine Schule* (Berlin), 193–4.

——(1992), *Aristotle* De Partibus Animalium I *and* De Generatione Animalium I (Oxford).

BARKAN, L. (1986), *The Gods Made Flesh: Metamorphosis and the Pursuit of Paganism* (New Haven).

BARNES, J. (ed.) (1995), *The Cambridge Companion to Aristotle* (Cambridge).

—— and J. ANNAS (1985), *The Modes of Scepticism* (Cambridge).

BARRA, G. (1954), 'La polemica anti-religiosa nel V. libro di Lucrezio', *Rendiconti della Accademia di Archeologia, Lettere e Belle Arti, Napoli*, 29, 141–70.

BAUR, P. (1912), *Centaurs in Ancient Art: The Archaic Period* (Berlin).

BAXTER, T. M. S. (1992), *The Cratylus: Plato's Critique of Naming*, Philosophia Antiqua, 58 (Leiden).

BEAVIS, I. C. (1988), *Insects and Other Invertebrates in Classical Antiquity* (Exeter).

BERNARD, E. (1960), *Die Tmesis der Präposition in lateinischen Verbalcomposita* (Winterthur).

BERNS, G. (1976), 'Time and Nature in Lucretius *De rerum natura*', *Hermes*, 104, 477–92.

BERTELLI, L. (1989), 'I sogni della fame: dal mito all'utopia gastronomica', in P. Scarpi and O. Longo, *Homo Edens* (Milan), 103–14.

BERTOLI, E. (1980), *Tempora rerum: modalità del progresso umano in Lucrezio* (Verona).

BETENSKY, A. (1976), 'A Lucretian Version of Pastoral', *Ramus*, 5, 45–58.

BEYE, C. R. (1963), 'Lucretius and Progress', *Classical Journal*, 58, 160–9.

BIGNONE, E. (1916), *Empedocle* (Turin).

—— (1929), 'Ennio ed Empedocle', *Rivista di filologia e d'istruzione classica*, 57, 10–130.

BLACKMORE, SIR RICHARD (1712), *Creation* (London).

BLICKMAN, D. R. (1989), 'Lucretius, Epicurus and Prehistory', *Harvard Studies in Classical Philology*, 92, 157 ff.

BLUNDELL, S. (1986), *The Origins of Civilization in Greek and Roman Thought* (London).

BOLLACK, J. (1965–9), *Empédocle* (Paris).

—— (1969), 'Les Maximes de l'Amitié', in Association Guillaume Budé, 1969.

BÖMER, F. (1974), *P. Ovidius Naso 'Metamorphosen'* (Heidelberg).

BONELLI, G. (1976), 'Lucrezio V.1028–90: analisi estetica', *Rivista di Studi Classici*, 24, 241–51.

BONHEIM, H. (1982), *The Narrative Modes* (Cambridge).

BORGEAUD, P. (1988), *The Cult of Pan in Ancient Greece* (Chicago).

BORGES, JORGE LUIS (1967), *The Book of Imaginary Beings* (London).

BORLE, J.-P. (1962), 'Progrès ou déclin de l'humanité?', *Museum Helveticum*, 19, 162–76.

BOUQUET, J. (1979), 'Progrès chez Lucrèce et Senèque', *Alma*, 6, 13–22.

BOYANCÉ, P. (1941), 'Une exégèse stoïcienne chez Lucrèce', *Revue des études latines*, 19, 147–66.

Boyancé, P. (1962), 'Epicure, la poésie et la vênus de Lucrèce', *Revue des études anciennes*, 64, 404–10

——(1963), *Lucrèce et l'épicurisme* (Paris).

Boys-Stones, G. (2001), *Post-Hellenistic Philosophy* (Oxford).

Bradley, E. M. (1972), 'Lucretius and the Irrational', *Classical Journal*, 68, 331–40.

Brien, P. (1968), 'La Génération des êtres vivants dans la philosophie épicurienne', *Revue des synthèses*, 89, 311 ff.

Brisson, L. (1994), *Le Même et l'Autre dans la structure ontologique du Timée de Platon* (Sankt Augustin).

——(1995), *Inventer l'Univers* (Albany).

——(1997), *Le Sexe incertain: androgynie et hermaphrodisme dans l'antiquité* (Paris).

Brown, R. D. (1987), *Lucretius on Love and Sex: A Commentary on* De rerum natura *IV, 1030–1287*, Columbia Studies in the Classical Tradition, 15 (Leiden).

Buchheit, V. (1986), 'Frühling in den Eklogen: Vergil und Lukrez', *Rhenisches Museum*, 129, 123–41.

Buckland, Rev. W. (1823), *Reliquiae Diluvianae* (Oxford).

Buffière, F. (1956), *Les Mythes d'Homère et la pensée grecque* (Paris).

Burchfield, J. D. (1975), *Lord Kelvin and the Age of the Earth* (New York).

Burkert, W. (1972), trans. E. L. Minar, *Lore and Science in Ancient Pythagoreanism* (Cambridge, Mass.).

Burkhardt, R. W. (1995), *The Spirit of System: Lamarck and Evolutionary Biology* (Cambridge, Mass.).

Burnyeat, M. F. (1999), Review of Martin and Primavesi, 1998, *L'Empédocle de Strasbourg*, in *Times Literary Supplement*, 28 May 1999, available online at http://www.the-tls.co.uk/tp/54829/PRN/edition/index.html

Caduff, G. A. (1986), *Antike Sintflutsagen, Hypomnemata: Untersuchungen zur Antike und zu ihrem Nachleben* (Göttingen).

Calvino, Italo (1999*a*), trans. M. McLaughlin, *Why Read the Classics?* (London).

——(1999*b*), 'Ovid and Universal Contiguity', in Calvino, 1999*a*, 25–35.

Campbell, G. L. (1999), Review of Sedley, 1998, in *Bryn Mawr Classical Review*, 29 Oct.

——(2000), 'Zoogony and Evolution in *Timaeus*, the Presocratics, Lucretius and Darwin', in Wright, 2000, 145–80.

——(2002*a*), 'Lucretius 5.1011–27: The Origins of Justice and the Prisoner's Dilemma', *Leeds International Classical Studies*, 1.3, 1–12, http://www.leeds.ac.uk/classics/lics/2002/200200.pdf

——(2002*b*), 'Lucretius and the Memes of Prehistory' (Discussion Paper 1, Nov. 2002), in *Leeds International Classical Studies*, http://www.leeds.ac.uk/classics/lics/2002/200200.pdf

CARPENTER, T. H. (1984), *Dionysian Imagery in Archaic Greek Art* (Oxford).

CASSATA, L. (1986), 'Sul testo di Lucr. V (a proposito di un nuovo commento al V libro del *De rerum natura*)', *Vichiana*, 15, 265–87.

CASSON, L. (1986), *Ships and Seamanship in the Ancient World* (2nd edn., Princeton).

CASTNER, C. J. (1987), '*De rerum natura* 5.101–3: Lucretius' Application of Empedoclean Language to Epicurean Doctrine', *Phoenix*, 41, 40–9.

CATTO, B. A. (1988–9), 'Venus and Natura in Lucretius *De rerum natura* 1.1–23 and 2.167–74', *Classical Journal*, 84, 97–104.

——(1998), *Selections from Lucretius* De rerum natura*: Edited for Students by Bonnie A. Catto; with a Foreword by Kirk Summers* (Wauconda, Ill.).

CHADWICK, H. (1980), *Origen Contra Celsum* (Cambridge).

CHILDE, V. GORDON (1936), *Man Makes Himself* (London).

——(1942), *What Happened in History* (London).

CHILTON, C. W. (1962), 'The Epicurean Theory of the Origin of Language: A Study of Diogenes of Oinoanda frs. X and XI (W)', *American Journal of Philology*, 83, 159–67.

——(1980), '*DRN* 5.849–54', *Classical Quarterly*, NS 30, 378–80.

CLARKE, M. L. (1970), 'Two Passages in Lucretius', *Classical Review*, NS 20, 9–10.

CLASSEN, C. J. (1968), 'Poetry and Rhetoric in Lucretius', *Transactions of the American Philological Association*, 99, 77–118.

CLAUSEN, W. V. (1994), *A Commentary on Virgil's* Eclogues (Oxford).

CLAY, D. (1983), *Lucretius and Epicurus* (Ithaca, NY).

——(1995), 'Framing the Margins of Philodemus and Poetry', in Obbink, 1995, 3–14.

——and A. PURVIS (1999), *Four Island Utopias. Being: Plato's Atlantis, Euhemeros of Messene's Panchaia, Iamboulos' Island of the Sun, Sir Francis Bacon's New Atlantis* (Newburyport, Mass.).

CLEMENTI, SIR C. (1936), *Pervigilium Veneris: The Vigil of Venus* (Oxford).

COLE, T. (1990), *Democritus and the Sources of Greek Anthropology* (Atlanta).

COLEMAN, R. (1977), *Vergil:* Eclogues (Cambridge).

COLES, J., R. BEWLEY, and P. MELLARS (eds.) (1999), *World Prehistory: Studies in Honour of Grahame Clark*, Proceedings of the British Academy, 99 (Oxford).

Collard, C. (1984), *Euripides* Supplices (Leipzig).

Corballis, M. (1999), 'The Gestural Origins of Language', *American Scientist*, 87, 138–45.

Costa, C. D. N. (ed.) (1974), *Seneca*, Greek and Latin Studies, Classical Literature and its Influence (London).

——(1984), *Lucretius* De rerum natura *V* (Oxford).

Cuvier, Baron G. (1805), *Lecons d'Anatomie Comparee* (Paris).

——(1806), *Recherches sur les ossemens fossiles de quadrupèdes* (Paris).

——(1813), *Essay on the Theory of the Earth*, trans. B. Kerr (Edinburgh).

Dahlbom, B. (ed.) (1993), *Dennett and his Critics: Demystifying Mind* (Cambridge, Mass.).

Dahlmann, J. H. (1928), *De Philosophorum Graecorum Sententiis ad Loquellae Originem Pertinentibus Capita Duo* (Diss., Leipzig).

Dalrymple, G. Brent (1991), *The Age of the Earth* (Stanford).

Dalzell, A. (1997), *The Criticism of Didactic Poetry: Essays on Lucretius, Virgil, and Ovid* (Toronto).

Danek, Z. (1986), 'De Origine Linguae quid ab Epicuro et Lucretio Iudicatum Sit', *Meander*, 41, 225–34.

Darwin, C. (1859), *On the Origin of Species* (London; 6th edn. 1872).

——(1871), *The Descent of Man and Selection in Relation to Sex* (London).

Daudin, H. (1926–7), *Cuvier et Lamarck: les classes zoologiques et l'idée de série animale* (Paris).

Davies, M. (1987), 'Description by Negation: History of a Thought-Pattern in Ancient Accounts of Blissful Life', *Prometheus*, 13, 265 ff.

——(1988), 'Ere the World Began To Be: Description by Negation in Cosmogonic Literature', *Prometheus*, 14, 15 ff.

Dawkins, R. (1976), *The Selfish Gene* (Oxford).

——(1986), *The Blind Watchmaker* (Harlow).

——(1993), 'Viruses of the Mind', in Dahlbom, 1993. Available online at http://www.santafe.edu/~shalizi/Dawkins/viruses-of-the-mind.html

——(1996), *Climbing Mount Improbable* (London).

de Falco, V. (1923), *L'Epicureo Demetrio Lacone* (Naples).

De Lacy, P. H. (1939), 'The Epicurean Analysis of Language', *American Journal of Philology*, 60, 85–92.

——(1969), 'Limit and Variation in the Epicurean Philosophy', *Phoenix*, 23, 104–13

——(1983), 'Lucretius and Plato', in *Συζήτησις: Studi sull'epicureismo greco e romano offerti a Marcello Gigante* (Naples), 291–307.

De Léry, J. (1578), *Histoire d'un voyage faict en la terre du Bresil* (Geneva), ed. J. Whatley, *Jean De Léry*, History of a Voyage to the Land of Brazil (Berkeley, 1990).

DE QUEHEN, H. (1996), *Lucy Hutchinson's Translation of Lucretius* De rerum natura (London).

DEAN-JONES, L. A. (1996), *Women's Bodies in Classical Greek Science* (Oxford).

DENNETT, D. (1990), 'Memes and the Exploitation of Imagination', *Journal of Aesthetics and Art Criticism*, 48, 127–35.

—— (1995), *Darwin's Dangerous Idea* (New York).

DENNIS, G. (1883), *The Cities and Cemeteries of Etruria* (London).

DENYER, N. (1983), 'The Origins of Justice', in *Συζήτησις: Studi sull'epicureismo greco e romano offerti a Marcello Gigante* (Naples), 133–52.

DETIENNE, M. (1972), *Les Jardins d'Adonis* (Paris).

DIONIGI, I. (1988), *Lucrezio: le parole e le cose* (Bologna).

DODDS, E. R. (1973), *The Ancient Concept of Progress and Other Essays on Greek Literature and Belief* (Oxford).

DUBAN, J. (1982), 'Venus, Epicurus and *naturae species ratioque*', *American Journal of Philology*, 103, 165–77.

DUBOIS, P. (1982), *Centaurs and Amazons: Women and the Pre-history of the Great Chain of Being* (Ann Arbor, Mich.).

—— (1988), *Sowing the Body: Psychoanalysis and the Ancient Representation of Women* (Chicago and London).

DUDLEY, D. R. (ed.) (1965), *Lucretius*, Studies in Latin Literature and its Influence (London).

DUMÉZIL, G. (1929), *Le Problème des centaures: étude de mythologie compareé indo-européenne* (Paris).

DUTOIT, E. (1936), *Le Thème de l'adynaton dans la poésie antique* (Paris).

DYSON, F. (1979), *Disturbing the Universe* (New York).

EDELSTEIN, L. (1943/4), 'Aristotle and the Concept of Evolution', *Classical Weekly*, 37, 148–50.

—— (1967), *The Idea of Progress in Classical Antiquity* (Baltimore).

EDWARDS, M. J. (1989), 'Lucretius, Empedocles and Epicurean Polemics', *Antike und Abendland*, 35, 104 ff.

—— (1993), '*Aeternus Lepos*: Venus, Lucretius and the Fear of Death', *Greece and Rome*, 40, 68–78.

ELDREDGE, N. (1995), *Reinventing Darwinism: The Great Evolutionary Debate* (New York).

—— and S. J. GOULD (1972), 'Punctuated Equilibria: An Alternative to Phyletic Gradualism', in T. J. M. Schopf (ed.), *Models in Paleobiology* (San Francisco).

ELIADE, M. (1963), *Myth and Reality*, trans. W. R. Trask (New York).

ELMAN, J. L., et al. (1995), *Rethinking Innateness: A Connectionist Perspective on Development* (Cambridge, Mass.).

ELSBERRY, W. (1996–7), 'Punctuated Equilibria', online in the 'Talk

Origins Archive', at http://talkorigins.org/faqs/punc-eq.html

Evely, R. D. G. (ed.) (1996), *Minotaur and Centaur: Studies in the Archaeology of Crete and Euboea Presented to Mervyn Popham* (Oxford).

Everson, S. (1994), *Language*, Companions to Ancient Thought, 3 (Cambridge).

Farley, J. (1977), *The Spontaneous Generation Controversy from Descartes to Oparin* (Baltimore).

Farrel, J. (1991), *Vergil's* Georgics *and the Traditions of Ancient Epic* (Oxford).

Farrington, B. (1939), *Science and Politics in the Ancient World* (London).

——(1953), '*Vita Prior* in Lucretius', *Hermathena*, 81, 59–62.

——(1954), 'Lucretius and Manilius on Friendship', *Hermathena*, 83, 10–16.

——(1958), 'Virgil and Lucretius', *Acta Classica*, 1, 44–50.

Feeney, D. C. (1978), 'Wild Beasts in the *DRN*', *Prudentia*, 10, 15–22.

Ferguson, J. (1975), *Utopias of the Classical World* (London).

——(1987), 'Epicurean Language Theory and Lucretian Practice', *Liverpool Classical Monthly*, 12, 100–5.

Festugière, A. J. (1955), *Epicurus and his Gods* (Oxford).

Fitzgerald, W. (1984), 'Lucretius' Cure for Love in the *De rerum natura*', *Classical World*, 78, 73–86.

Fleischmann, W. B. (1964), *Lucretius and English Literature 1680–1740* (Paris).

Formisano, L. (1992), *Letters from a New World: Amerigo Vespucci's Discovery of America* (New York).

Fowler, D. P. (1982), 'Lucretius and the Development of Civilisation' (review of Manuwald, 1980) in *Classical Review*, 32.2.

——(1983), 'A Commentary on Lucretius *De rerum natura* 2.1–332' (Diss., Oxford) (= Fowler, 2002).

——(1984), Review of Gigante, 1981, in *Oxford Studies in Ancient Philosophy*, 239 ff.

——(1989), 'Lucretius and Politics', in M. Griffin and J. Barnes (eds.), *Philosophia Togata* (Oxford), 120–50.

—— (1993), 'The Pagination of the Archetype of Lucretius' *De rerum natura* Two Notes', in H. D. Jocelyn (ed.), *Tria Lustra*, Liverpool Classical Papers, 3 (Liverpool), 237–41.

——(1996*a*), 'The Feminine Principle: Gender in the *De rerum natura*', in Giannantoni and Gigante, 1996, 813–22 (= Fowler, 2002, 444–52).

——(1996*b*), 'God the Father (Himself) in Vergil', *Proceedings of the Virgil Society*, 22, 35–52 (= Fowler, 2000*b*, 218–34).

——(2000*a*), 'Philosophy and Literature in Lucretian Intertextuality', in Fowler, 2000*b*, 138–55.

——(2000*b*), *Roman Constructions: Readings in Postmodern Latin* (Oxford).

——(2000*c*), 'Criticism as Commentary and Commentary as Criticism in the Age of Electronic Media', in G. W. Most (ed.), *Commentaries—Kommentare* (Göttingen), 426–42.

——(2000*d*), 'The Didactic Plot', in M. Depew and D. Obbink (eds.), *Matrices of Genre: Authors, Canons, and Society* (Cambridge, Mass.), 205–19.

——(2002), *Lucretius on Atomic Motion: A Commentary on Lucretius* De rerum natura 2.1–332 (Oxford).

FOX KELLER, E., and E. A. LLOYD (eds.) (1992), *Keywords in Evolutionary Biology* (Cambridge, Mass.).

FRAENKEL, E. (1960), *Elementi plautini in Plauto* (Florence).

FRAZER, SIR J. G. (1922), *The Golden Bough* (London).

——(1929), *The Fasti of Ovid* (London, 1929).

FREDOUILLE, J. C. (1972), 'Lucrèce et le double progrès contrastant', *Pallas*, 19, 11–27.

FURLEY, D. J. (1966), 'Lucretius and the Stoics', *Bulletin of the Institute of Classical Studies*, 13, 13–33.

——(1967), *Two Studies in the Greek Atomists* (Princeton).

——(1970), 'Variations on Themes from Empedocles in Lucretius' Proem', *Bulletin of the Institute of Classical Studies*, 17, 55–64 (= Furley, 1989, 172–82).

——(1978), 'Lucretius the Epicurean on the History of Man', in *Lucrèce*, Entretiens sur l'Antitquité classique, 24 (Geneva), 1–27.

——(1986), 'Nothing to Us?', in M. Schofield and G. Striker (eds.), *The Norms of Nature: Studies in Hellenistic Ethics* (Cambridge), 75–91.

——(1987), *The Greek Cosmologists*, i (Cambridge).

——(1989), *Cosmic Problems* (Cambridge).

——(1996), 'The Earth in Epicureanism and Contemporary Astronomy', in Giannantoni and Gigante, 1996.

GALE, M. (1991), 'Man and Beast in Lucretius and the *Georgics*', *Classical Quarterly*, NS 41, 414–26.

——(1994), *Myth and Poetry in Lucretius* (Cambridge).

——(1995), 'Virgil's Metamorphoses: Myth and Allusion in the *Georgics*', *Proceedings of the Cambridge Philological Society*, 41, 36–61.

——(2000), *Virgil on the Nature of Things* (Oxford).

——(2001), 'Etymological Word-Play and Poetic Succession in Lucretius', *Classical Philology*, 96, 168–72.

Galinsky, K. (1997), 'The Speech of Pythagoras in Ovid Metamorphoses 15', *Papers of the Leeds International Latin Seminar.* Also online at http://www.utexas.edu/depts/classics/

Gaster, T. H. (1969), *Myth, Legend and Custom in the Old Testament* (London).

Gatz, B. (1967), *Weltalter, goldene Zeit und sinnverwandte Vorstellungen* (Hildesheim).

Giancotti, F. (1981), 'Origini e fasi della religione nella storia dell'umanità di Lucrezio', *Elenchos*, 2, 45–78.

——(1989), *Religio, natura, voluptas: studi su Lucrezio* (Bologna).

——(1996), *Lucrezio*: La Natura*: introduzione, testo criticamente riveduto, traduzione e commento di Francesco Giancotti* (Milan).

Giannantoni, G. and M. Gigante (eds.) (1996), *Epicureismo greco e romano: Atti del Congresso Internazionale, Napoli 19–26 maggio 1993* (Naples).

Giesecke, A. L. (2000), *Atoms, Ataraxy, and Allusion: Cross-generic Imitation of the* De rerum natura *in Early Augustan Poetry*, Spudasmata, 76 (Hildesheim).

Gigante, M. (1957), 'Lucretius Sisyphum *Critiae* est imitatus', *Dionysio*, 20.3–4, 97–8.

——(1981), *Scetticismo e epicureismo* (Naples).

——(1992), *Cinicismo e epicureismo* (Naples).

Gill, C., Postlethwaite, N., and R. Seaford (eds.) (1998), *Reciprocity in Ancient Greece* (Oxford).

Gillis, D. J. (1967), 'Pastoral Poetry in Lucretius', *Latomus*, 26, 339–62.

Giussani, C. (1896), *Studi lucreziani* (Turin).

Glidden, D. K. (1983), 'Epicurean Semantics', in *Συζήτησις: Studi sull'epicureismo greco e romano offerti a Marcello Gigante* (Naples), 186–226.

Gneisse, C. (1878), *De Versibus in Lucretii Carmine Repetitis* (Diss., Strasbourg).

Goldschmidt, R. (1940), *The Material Basis of Evolution* (New Haven; repr. 1982).

Goldschmidt, V. (1977), *La Doctrine d'Epicure et le droit* (Paris).

Gordon, C. (1962), *A Bibliography of Lucretius* (London).

Gosse, P. H. (1857), *Omphalos: An Attempt to Untie the Geological Knot* (London).

Gotthelf, A. (1985) (ed.), *Aristotle on Nature and Living Things* (Bristol).

——and J. G. Lennox (eds.) (1987), *Philosophical Issues in Aristotle's Biology* (Cambridge).

Gould, S. J. (1985), *The Flamingo's Smile* (London).

—— and N. Eldredge (1972), 'Punctuated Equilibria: An Alternative to Phyletic Gradualism', in T. Schopf (ed.), *Models in Paleobiology* (San Francisco), 82–115.

—— and R. C. Lewontin (1979), 'The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme', *Proceedings of the Royal Society of London*, B205, 581–98.

Granger, H. (1984), 'Aristotle on Genus and Differentiae', *Journal of the History of Philosophy*, 22, 1–23.

Graver, M. (1990), 'The Eye of the Beholder: Perceptual Relativity in Lucretius', in Nussbaum, 1990, 91–116.

Green, W. M. (1942), 'The Dying World of Lucretius', *American Journal of Philology*, 63, 51–60.

Greenblatt, S. (1991), *Marvellous Possessions: The Wonder of the New World* (Oxford).

Griffiths, Thomas F. W. (1998), 'Ethnoeconomics and Native Amazonian Livelihood: Culture and Economy among the Nipóde-Uitoto of the Middle Caquetá Basin in Colombia' (Diss., Oxford).

Grilli, A. (1953), 'La posizione di Aristotele, Epicuro e Posidonio nei confronto della storia della civiltá', *Rendiconti dell'Istituto Lombardo di Scienze e Lettere, Classe di Lettere e Scienze Morali e Storiche*, 86, 3–44.

Grimal, P. (1951), *Dictionnaire de la mythologie grecque et romaine* (Paris).

Grummond, W. W. de (1982), 'On the Interpretation of *DRN* 5.1308–49', *Atene e Roma*, 27, 50–6.

Guthrie, W. K. C. (1950), *The Greeks and their Gods* (London).

—— (1957), *In the Beginning* (London).

—— (1962–9), *A History of Greek Philosophy* (Cambridge).

—— (1971), *The Sophists* (Cambridge).

Hadzsits, G. (1963), *Lucretius and his Influence* (New York).

Hall, J. (1981), *Lucian's Satire* (New York).

Halton, T. (1975), 'Sisyphus from Homer to Camus', *Classical Folia*, 29, 141–51.

Hamelin, O. (1931), *Aristotle:* Physique *2, traduction et commentaire* (Paris).

Hankinson, R. J. (1995), 'Philosophy of Science', in Barnes, 1995.

Hardie, P. (1986), *Virgil's* Aeneid*: Cosmos and Imperium* (Oxford).

—— (1995), 'The Speech of Pythagoras in Ovid's *Metamorphoses* 15: Empedoclean Epos', *Classical Quarterly*, NS 45, 204–14.

Harraeur, C. (1994), *Kosmos und Mythos: Die Weltgotthymnen und die mythologischen Hymnen des Michael Marullus* (Vienna).

Harris, C. R. S. (1973), *The Heart and the Vascular System in Ancient Greek Medicine* (Oxford).

HARRISON, S. (2002), 'Ennius and the Prologue to Lucretius *DRN* 1 (1.1–148)', *Leeds International Classical Studies*, 1.4 (April), online at http://www.leeds.ac.uk/classics/lics/index.html

HAVELOCK, E. (1957), *The Liberal Temper in Greek Politics* (London).

HELLEGOUARC'H, J. (1964), 'Le Monosyllabe dans l'hexamètre latin', *Études et commentaires*, 50 (Paris).

—— (1972), *Le Vocabulaire latin des relations et des parties politiques sous la République* (Paris).

HENDERSON, J. (1975), *The Maculate Muse: Obscene Language in Attic Comedy* (London).

HENRICHS, A. (1974), 'Die Kritik der stoischen Theologie im P. Herc. 1428', *Cronache Ercolanesi*, 4, 5–32.

HERBERT-BROWN, G. (1994), *Ovid and the Fasti* (Oxford).

HERMAN, G. (1998), 'Reciprocity, Altruism, and the Prisoner's Dilemma: The Special Case of Classical Athens', in Gill, Postlethwaite, and Seaford, 1998, 199–225.

HERSHBELL, J. P. (1974), 'Empedoclean Influences on the *Timaeus*', *Phoenix*, 28, 145–66.

HOPPER, K. (1995), *Flann O'Brien: A Portrait of the Artist as a Young Post-Modernist* (Cork).

HOYLE, F., and C. WICKRAMASINGHE (1981), *Evolution from Space* (London).

HULL, D. L. (1973), *Darwin and his Critics* (Cambridge, Mass.).

HUME, D. (1779), *Dialogues Concerning Natural Religion* (London).

HUSSEY, E. (1972), *The Presocratics* (London).

INGALLS, W. B. (1971), 'Repetition in Lucretius', *Phoenix*, 25, 227–36.

JANE, C. (1930), *Select Documents Illustrating the Four Voyages of Columbus* (London).

JANKO, R. (2000), *Philodemus* On Poems *Book One* (Oxford).

JENKYNS, R. (1989), 'Vergil and Arcadia', *Journal of Roman Studies*, 79, 26–39.

JOHNSON, W. R. (2000), *Lucretius and the Modern World* (London).

JOHNSTON, P. A. (1980), *Vergil's Agricultural Golden Age: A Study of the* Georgics, *Mnemosyne*, Suppl. 60.

JONES, C. P. (1986), *Culture and Society in Lucian* (Cambridge, Mass.).

JONES, H. (1989), *The Epicurean Tradition* (London).

JOPE, J. (1983), 'Lucretius' Psychoanalytical Insight', *Phoenix*, 37, 224–38.

—— (1985), 'Lucretius, Cybele and Religion', *Phoenix*, 39, 250–62.

KAHN, C. (1960), *Anaximander and the Origins of Greek Cosmology* (New York).

KELLER, A. C. (1951), 'Lucretius and the Idea of Progress', *Classical Journal*, 46, 185–8.

KENNEDY, D. (1987), 'Arcades Ambo: Virgil, Gallus and Arcadia', *Hermathena*, 143, 47–59.

——(2002), *Rethinking Reality: Lucretius and the Textualization of Nature* (Ann Arbor).

KENNEY, E. J. (1972), 'The Historical Imagination of Lucretius', *Greece and Rome*, 19, 12–24.

KING, H. (1994), 'Sowing the Field: Greek and Roman Sexology', in Porter and Teich, 1994, 29–46.

KIRK, G. S. (1962), *The Songs of Homer* (Cambridge).

——(1970), *Myth: Its Meanings and Functions in Ancient Greek and Other Cultures* (Berkeley).

——(1990), *The Iliad: A Commentary* (Cambridge).

KLEINGÜNTHER, A. (1933), *Πρῶτος Ἑυρετής*, *Philologus*, Suppl. 26 (Leipzig).

KLEVE, K. (1969), 'Lucrèce, l'épicurisme et l'amour', in Association Guillaume Budé, 1969, 376–83.

——(1978), 'The Philosophical Polemics in Lucretius', *Lucrèce*, in Entretiens sur l'Antiquité classique, 24 (Geneva), 39–71.

——(1989), 'Lucretius in Herculaneum', *Cronache Ercolanesi*, 19, 5–27.

KLINZ, A. (1933), *Hieros Gamos* (Halle).

KNOW, P. E. (1992), 'Love and Horses in Virgil's *Georgics*', *Eranos*, 90, 43–53.

KONSTAN, D. (1973), *Some Aspects of Epicurean Psychology*, Philosophia Antiqua, 25 (Leiden).

KRANZ, W. (1929), 'Zwei euripideischen chorlieder', *Hermes*, 64, 497–500.

KROPOTKIN, PETER (1902), *Mutual Aid: A Factor in Evolution* (London).

LAKS, A., and M. SCHOFIELD (eds.) (1995), *Justice and Generosity: Studies in Hellenistic Social and Political Philosophy* (Cambridge).

LAMARCK, J.-B. (1809), *Philosophie zoologique* (Paris).

——(1835), *Histoire naturelle des animaux sans vertèbres* (Paris).

LANA, I. (1950), 'Le dottrine di Pitagora e di Democrito intorno all'origine dello stato', *Atti della Accademia Nazionale dei Lincei, Rendiconti, Classe di Scienze Morali, Storiche, e Filologiche*, ser. 8.5, 184 ff.

LANDOLFI, L. (1985), 'Virgilio, Lucrezio e le *Laudes veris*', *Quaderni urbinati di cultura classica*, 49, 91–109.

LAPIDGE, M. (1980), 'A Stoic Metaphor in Late Latin Poetry: The Binding of the Cosmos', *Latomus*, 39, 817–37.

Lennox, J. (1984), 'Recent Philosophical Studies of Aristotle's Biology', *Ancient Philosophy*, 4, 73–82.

Lévêque, P. (1959), *Aurea Catena Homeri: une étude sur l'allégorie grecque* (Paris).

Levine, D. B. (1989), 'Acorns and Primitive Life in Greek and Latin Literature', *Classical and Modern Literature*, 9.2, 87–95.

Lévi-Strauss, C. (1977), *Structural Anthropology* (Harmondsworth).

Lewin, R. (1998*a*), *Origin of Modern Humans* (New York).

——(1998*b*), *Principles of Human Evolution* (Oxford).

Lewis, C. S. (1953), *The Silver Chair* (London).

——(1955), *The Magician's Nephew* (London).

Linnaeus, C. (1758), *Systema Naturae* (London; 1991 edn.).

Livrea, E. (1998), 'A New Pythagorean Fragment and Homer's Tears in Ennius', *Classical Quarterly*, NS 48, 559–61.

Lloyd, A. C. (1962), 'Genus, Species and Ordered Series in Aristotle', *Phronesis*, 7, 67–90.

——(1966), *Polarity and Analogy: Two Types of Argumentation in Early Greek Thought* (Cambridge).

Lloyd-Jones, H. (1971), *The Justice of Zeus* (Berkeley).

Loenen, J. H. (1954), 'Was Anaximander an Evolutionist?', *Mnemosyne*, 7, 215–32.

Long, A. A. (1971), '*Aisthesis*, *Prolepsis* and Linguistic Theory in Epicurus', *Bulletin of the Institute of Classical Studies*, 18, 114–33.

——(1974), *Hellenistic Philosophy* (London).

——(1977), 'Chance and Natural Law in Epicureanism', *Phronesis*, 22, 63–88.

——(1986), 'Pleasure and Social Utility—The Virtues of being Epicurean', in *Aspects de la philosophie helénistique*, Entretiens sur l'Antiquité classique, 32 (Geneva), 283–316.

Longo, O., and P. Scarpi (eds.) (1989), *Homo edens: regimi, miti e pratiche dell'alimentazione nella civiltà del Mediterraneo* (Verona).

Longrigg, J. (1985), 'A Seminal Debate?', in Gotthelf, 1985, 280–1.

Lonie, I. M. (1969), 'On the Botanical Excursus in *De natura pueri* 22–7', *Hermes*, 97, 391–411.

Loraux, N. (1993), *Children of Athena* (Princeton).

Louis, P. (1964–9), *Aristote: Histoire des animaux* (Paris).

——(1968), 'La Génération spontanée chez Aristote', *Revue des synthèses*, 89, 297–8.

Lovejoy, A. O. (1936), *The Great Chain of Being* (Cambridge, Mass.).

Løvtrup, S. (1987), *Darwinism: The Refutation of a Myth* (London).

Lubbock, Sir J. (1874), *The Origin of Civilization and the Early Condition of Man* (New York).

MALINOWSKI, B. (1932), *The Sexual Life of Savages in North-Western Melanesia* (London).

MANUWALD, B. (1980), *Der Aufbau der lukrezischen Kulturentstehungslehre* (Mainz).

MARCOVICH, M. (1967), *Heraclitus* (Merida).

MASON, S. L. R. (1995), 'Acornutopia? Determining the Role of Acorns in Past Human Subsistence', in Wilkins, Harvey, and Dobson, 1995, 12–24.

MASSON, J. (1907), *Lucretius: Epicurean and Poet* (London).

MAUPERTUIS, P.-L. MOREAU DE (1845), *Vénus physique* (Paris).

MAYOR, A. (2000), *The First Fossil Hunters: Paleontology in Greek and Roman Times* (Princeton).

MAYOR, J. E. B. (1853), *D. Junii Juvenalis satiræ xiii: Thirteen satires of Juvenal* (Cambridge).

MAYR, E. (1961), 'Cause and Effect in Biology', *Science*, 134, 1501–6.

——(1970), *Populations, Species and Evolution: An Abridgement of Animal Species and Evolution* (Cambridge, Mass.).

MELVILLE, R. (1997), *Lucretius: On the Nature of the Universe*, trans. with introd. and notes by P. and D. P. Fowler (Oxford).

MERLAN, P. H. (1950), 'Lucretius, Primitivist or Progressivist?', *Journal of the History of Ideas*, 11, 364 ff.

MERRILL, W. A. (1891), 'The Signification and Use of the Word *Natura* by Lucretius', *Transactions of the American Philological Association*, 22, 32–5.

——(1918*a*), 'Criticisms of the Text of Lucretius with Suggestions for its Improvement', *University of California Publications in Classical Philology*, 3.4, 1–133.

——(1918*b*), 'Parallelisms and Coincidences in Lucretius and Vergil', *University of California Publications in Classical Philology*, 3.4, 135–247.

——(1918*c*), 'Parallelisms and Coincidences in Lucretius and Ennius', *University of California Publications in Classical Philology*, 3.4, 249–64.

MILES G. B. (1975), '*Georgics* 3.209–294, *Amor* and Civilization', *California Studies in Classical Antiquity*, 8, 177–97.

——(1980), *Vergil's* Georgics (Berkeley).

MINYARD, J. D. (1978), *Mode and Value in the* De rerum natura*: A Study in Lucretius' Metrical Language*, *Hermes*, Einzelschriften 39 (Wiesbaden).

MITSIS, P. (1987), 'Friendship and Altruism in Epicureanism', *Oxford Studies in Ancient Philosophy*, 5 (Oxford).

——(1988), *Epicurus' Ethical Theory—The Pleasures of Invulnerability* (Ithaca, NY).

MONDI, R. (1983), 'The Homeric Cyclopes: Folktale, Tradition, and Theme', *Transactions of the American Philological Association*, 113, 17–38.

MONOD, J. (1972), *Chance and Necessity* (London).

MONTI, R. C. (1981), 'Lucretius on Greed, Political Ambition and Society', *Latomus*, 40, 48–66.

MOREAU, J. (1975), 'Le Mécanisme épicurienne et l'ordre de la nature', *Les Etudes philosophiques*, 30, 467–86.

MORGAN, J. R. (1985), 'Lucian's True Histories and the Wonders Beyond Thule of Antonius Diogenes', *Classical Quarterly*, NS 35, 475–90

MÜLLER, R. (1972), *Die epikureische Gesellschaftstheorie* (Berlin).

MYERS, S. K. (1994), *Ovid's Causes: Cosmogony and Aetiology in the* Metamorphoses (Ann Arbor).

MYNORS, R. A. B. (1990), *Vergil Georgics* (Oxford).

NAGEL, B. R. (1984), 'Amor, Ira, and Sexual Identity in Ovid's *Metamorphoses*', *Classical Antiquity*, 3, 236–55.

NILSSON, D. E. (1989), 'Vision, Optics and Evolution', *Bioscience*, 39, 298–307.

—— and S. PELGER (1994), 'A Pessimistic Estimate of the Time Taken for an Eye to Evolve', *Proceedings of the Royal Society of London*, B256, 53–8.

NORDEN, E. (1915), *Ennius und Vergilius* (Leipzig).

NUGENT, S. G. (1990), 'This Sex Which is Not One: De-constructing Ovid's Hermaphrodite', *Differences*, 2, 160–85.

—— (1994), 'Mater Matters: The Female in Lucretius' *De rerum natura*', *Colby Quarterly*, 30, 179–205.

NUSSBAUM, M. (1986*a*), *The Fragility of Goodness: Luck and Ethics in Greek Tragedy and Philosophy* (Cambridge).

—— (1986*b*), 'Therapeutic Arguments in Epicurus and Aristotle', in M. Schofield and G. Striker (eds.), *The Norms of Nature* (Oxford).

—— (ed.) (1990), *The Poetics of Therapy: Hellenistic Ethics in its Rhetorical and Literary Context* (Princeton).

—— (1994), *The Therapy of Desire* (Princeton).

OBBINK, D. (ed.) (1995), *Philodemus and Poetry: Poetic Theory and Practice in Lucretius, Philodemus and Horace* (Oxford).

—— (1996), *Philodemus* On Piety, *Part 1* (Oxford).

—— (forthcoming), *Philodemus* On Piety, *Part 2* (Oxford).

O'BRIEN, D. (1969), *Empedocles' Cosmic Cycle* (Cambridge).

O'BRIEN, FLANN (1967), *The Third Policeman* (London).

O'CONNOR, D. K. (1989), 'The Invulnerable Pleasures of Epicurean Friendship', *Journal of Greek, Roman and Byzantine Studies*, 30, 65–86.

OPARIN, A. I. (1968), *Genesis and Evolutionary Development of Life*, trans. E. Maass (New York).

OSBORNE, C. (1987), 'Empedocles Recycled', *Classical Quarterly*, NS 37, 24–50.

OSBORNE, R. (1994), 'Framing the Centaur', in Osborne and Goldhill, 1994, 52–84.

—— and S. GOLDHILL (eds.) (1994), *Art and Text in Ancient Greek Culture* (Cambridge).

OSMUN, G. F. (1956), 'Palaephatus—Pragmatic Mythographer', *Classical Journal*, 52.3, 131–7.

PAGE, T. E. (1898), *P. Vergili Maronis Bucolica et Georgica* (London).

PANOFSKY, E. (1937), 'The Early History of Man in a Cycle of Paintings by Piero di Cosimo', *Journal of the Warburg Institute* (repr. in id., *Studies in Iconology*, Oxford, 1939).

PARROT HICKERSON, N. (2000), *Linguistic Anthropology* (Orlando).

PASTEUR, L. (1876), *Etudes sur la Bière* (Paris).

PEARCE, T. E. V. (1966), 'The Enclosing Word Order in the Latin Hexameter', *Classical Quarterly*, NS 16, 140–71.

PEASE, A. S. (1955–8), *Cicero. De Natura Deorum*, 2 vols. (Cambridge, Mass.).

PELIKAN, J. (1997), *What Has Athens To Do With Jerusalem?* (Ann Arbor).

PELLEGRIN, P. (1982), *La Classification des animaux chez Aristote* (Paris).

—— (1985), 'Aristotle: A Zoology Without Species', in Gotthelf, 1985, 95–115.

PERELLI, L. (1967), 'La storia dell'umanità nel 5 libro di Lucrezio', *Atti della Academia delle Scienze di Torino*, 101, 117–285.

PEROSA, A. (ed.) (1951), *Michaelis Marulli Carmina* (Turi).

PIGEAUD, J. (1983), 'Epicure et Lucrèce et l'Origine du Langage', *Revue des études latines*, 61, 122–44.

PINKER, S. (1994), *The Language Instinct* (London).

PÖHLMANN, E. (1991), 'Lukrez als Quelle griechischer Kulturentstehungslehre (Zu Lukrez 5,1448–1457)', *Würzburger Jahrbücher für die Altertumswissenschaft*, NF 17, 217–28.

PÖHLMANN, R. (1879), *Hellenische Anschauungen, über den Zusammenhang zwischen Natur und Geschichte* (Leipzig).

PORTER, R., and M. TEICH (eds.) (1994), *Sexual Knowledge, Sexual Science* (Cambridge).

PUGLIA, E. (1988), *Demetrio Lacone: aporie testuali ed esegetiche in Epicuro (PHerc. 1012)* (Naples).

PUHVEL, J. (1976), 'The Origins of Greek *Kosmos* and Latin *Mundus*', *American Journal of Philology*, 97, 154–67.

Reeve, M. (1980), 'The Italian Tradition of Lucretius', *Italia Medioevale e Umanistica*, 23, 27–48.

Ridley, Mark (1996), *Evolution* (Oxford).

Ridley, Matt (1996), *The Origins of Virtue* (London).

Rist, J. M. (1972), *Epicurus: An Introduction* (Cambridge).

——(1980), 'Epicurus on Friendship', *Classical Philology*, 75, 121–9.

Robin, L. (1916), 'Sur la conception épicurienne de progrès', *Revue de métaphysique et de morale*, 22, 697 ff.

Robinson, M. (1999), 'Salmacis and Hermaphroditus: When Two Become One (Ovid *Met.* 4.285–388)', *Classical Quarterly*, NS 49, 212–23.

Robinson, R. (1969), 'The Theory of Names in Plato's *Cratylus*', in id., *Essays in Greek Philosophy* (Oxford).

Robinson, T. M. (1979), *Contrasting Arguments: An Edition of the Dissoi Logoi* (New York).

Romm, J. S. (1992), *The Edges of the Earth in Ancient Thought* (Princeton).

Röscher, W. H. (1884–1937), *Ausfürliches Lexikon der grieschischen und römischen Mythologie* (Leipzig).

Rostagni, A. (1924), *Il verbo di Pitagora* (Turin).

Ruch, M. (1969), 'Lucrèce et le problème de la civilisation', *Les Etudes classiques*, 37, 272–84.

Russell, D. A. (1974), 'Seneca's Letters to Lucilius', in Costa, 1974, 70–95.

Rusten, J. S. (1982), 'Ovid, Empedocles, and the Minotaur', *American Journal of Philology*, 103, 332–3.

Saint-Hilaire, G. (1818), *Philosophie anatomique* (Paris).

Sallmann, K. G. (1962), *Die Natur bei Lukrez, Archiv für Begriffsgeschichte*, 7 (Bonn).

Sauer, C. (1952), *Agricultural Origins and Dispersals* (New York).

Saylor, C. J. (1972), 'Man, Animal and the Bestial in Lucretius', *Classical Journal*, 67, 310–14.

——(1986), 'Animal Imagery in *DRN* and Vergil', *Florilegium*, 8, 1–10.

Schiesaro, A. (1990), *Simulacrum et Imago* (Pisa).

——Mitsis, P., and J. Strauss Clay (eds.) (1993), *Mega nepios: il destinatorio nell'epos didascalico*, Materiali e discussioni per l'analisi dei testi classici, 31 (Pisa).

Schiffler, B. (1976), *Die Typologie des Kentauren in der antiken Kunst* (Frankfurt am Main).

Schilling, R. (1954), *La Religion romaine de Vénus* (Paris).

Schindler, C. (2000), *Untersuchungen zu den Gleichnissen im römischen Lehrgedicht: Lukrez, Vergil, Manilius* (Göttingen).

SCHMIDT, J. (1990), *Lukrez, der Kepos und die Stoiker* (Frankfurt am Main).

SCHRIJVERS, P. H. (1970), *Horror ac Divina Voluptas: Etudes sur la poétique et la poésie de Lucrèce* (Amsterdam).

——(1974*a*), 'La Pensée de Lucrèce sur l'origine de la vie', *Mnemosyne*, 27, 245–61

——(1974*b*), 'La Pensée de Lucrèce sur l'origine du langage', *Mnemosyne*, 27, 337–64.

——(1978), 'Le Regard sur l'invisible', in *Lucrèce*, Entretiens sur l'Antiquité classique, 24 (Geneva), 77–114.

——(1983), 'Sur quelques aspects de la critique des mythes chez Lucrèce', in *Συζήτησις: Studi sull' epicureismo greco e romano offerti a Marcello Gigante* (Naples), 353–71.

—— (1994), 'Intertextualité et polémique dans le *De rerum natura* (V 925–1010): Lucrèce vs. Dicéarque de Messène', *Philologus*, 138, 288–304.

——(1996), 'Un chapitre de l'histoire de l'humanité: Lucrèce *DRN* 5.837–54', in Giannantoni and Gigante, 1996, 841–50.

——(1997), 'L'Homme et l'animal dans le *De rerum natura*: Lucrèce et la science de la vie', in Algra, Koenen, and Schrijvers, 1997, 151–61.

——(1999), *Lucrèce et les sciences de la vie*, *Mnemosyne*, Suppl. 186 (Leiden).

SEDLEY, D. N. (1973), 'Epicurus *On Nature* Book XXVIII', *Cronache Ercolanesi*, 3, 5–83.

——(1998), *Lucretius and the Transformation of Greek Wisdom* (Cambridge).

SEGAL, C. (1974), 'The Raw and the Cooked in Greek Literature: Structure, Values, Metaphor', *Classical Journal*, 69.4, 289–308.

——(1986), 'War, Death and Savagery in Lucretius: The Beasts in Battle in 5.1308–49', *Ramus*, 15, 1–34.

——(1990), *Lucretius on Death and Anxiety: Poetry and Philosophy in* De rerum natura (Princeton).

SEGL, A. (1970), *Die Pythagorasrede im 15. Buch von Ovids* Metamorphosen (Diss, Salzburg).

SELLAR, W. Y. (1876), *The Roman Poets of the Augustan Age* (Oxford).

SHARPLES, R. W. (1996), *Stoics, Epicureans and Sceptics: An Introduction to Hellenistic Philosophy* (London).

SIHVOLA, J. (1989), *Decay, Progress, the Good Life? Hesiod and Protagoras on the Development of Culture* (Helsinki).

SIKES, E. E. (1914), *The Anthropology of the Greeks* (London).

SKELTON, P. (ed.) (1993), *Evolution: A Biological and Palaeontological Approach* (Wokingham).

SKUTSCH, O. (1968), *Studia Enniana* (London).

Skutsch, O. (1985), *The* Annals *of Quintus Ennius* (Oxford).

Smith, M. F. (1966*a*), 'Some Lucretian Thought Processes', *Hermathena*, 102, 73–8.

——(1966*b*), 'Three Textual Notes on Lucretius (3.961–2, 5.1007–10, 5.1198–1203)', *Classical Review*, NS 16, 264.

——(1986), 'Lucretius and Diogenes of Oinoanda', *Prometheus*, 12, 193–207.

——(1993), *Diogenes of Oinoanda: The Epicurean Inscription* (Naples).

——(1997), 'The Chisel and the Muse: Diogenes of Oinoanda and Lucretius', in Algra, Koenen and Schrijvers, 1997, 67–78.

Solheim, W. (1972), 'An Earlier Agricultural Revolution', *Scientific American*, 206.4, 34–41.

Solmsen, F. (1951), 'Epicurus and Cosmological Heresies', *American Journal of Philology*, 72, 1–23.

——(1953), 'Epicurus on the Growth and Decline of the Cosmos', *American Journal of Philology*, 74, 34–51.

——(1961), 'αἴσθησις in Aristotelian and Epicurean Thought', *Mededelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afd. Letterkunde*, NS 24.8, 241–62.

——(1965), 'Love and Strife in Empedocles' Cosmology', *Phronesis*, 10, 109–48 (repr. in R. E. Allen and D. J. Furley (eds.), *Studies in Presocratic Philosophy*, ii (London, 1975), 221–64).

——(1968), *Kleine Schriften*, i (Hildesheim).

——(1977), 'Epicurus on Void, Matter and Genesis', *Phronesis*, 22, 263–81.

Sorabji, R. (1980), *Necessity, Cause and Blame: Perspectives on Aristotle's Theory* (London).

——(1983), *Time, Creation and the Continuum* (London).

Spencer, A. (1995), 'Many Worlds: The New Physics in Flann O'Brien's *The Third Policeman*', *Éire–Ireland: A Journal of Irish Studies*, 30.1, 145–58.

Spoerri, W. (1959), *Späthellenistiche Berichte über Welt, Kultur und Götter* (Basel).

Stanford, W. B. (1958), *The* Odessey *of Homer* (London).

Stein, P. (1909), *Teras* (Marburg).

Stenger, V. (1997), 'Intelligent Design: Humans, Cockroaches and the Laws of Physics', online in the 'Talk Origins Archive', at http://www.talkorigins.org/faqs/cosmo.html

Stern, J. (1996), *Palaephatus Περι Απιστων* (Wauconda, Ill.).

Stringer, C. (1993), *In Search of the Neanderthals* (London).

Taylor, M. (1947), 'Progress and Primitivism in Lucretius', *American Journal of Philology*, 68, 180–94.

Tenison, Thomas (1670), *The Creed of Mr. Hobbes Examined*, in

G. A. J. Rogers (ed.), *Early Responses to Hobbes* (London, 1996).

THOMAS, R. F. (1988), *Virgil* Georgics *I–II* (Cambridge).

THURY, E. M. (1987), 'Lucretius' Poem as a *Simulacrum* of the *Rerum Natura*', *American Journal of Philology*, 108, 180–97.

TOO, YUN LEE (1991), 'A Note on *Vis Abdita Quaedam. DRN* 5.1233', *Classical Quarterly*, NS 41, 255–7.

TOOHEY, P. (1996), *Epic Lessons: An Introduction to Ancient Didactic Poetry* (London).

TORREY, H. B., and F. FELIN (1937), 'Was Aristotle an Evolutionist?', *Quarterly Review of Biology*, 12, 1–18.

TOWNEND, G. B. (1969), 'Some Problems of Punctuation in the Latin Hexameter', *Classical Quarterly*, NS 19, 330–44.

——(1978), 'The Fading of Memmius', *Classical Quarterly*, NS 28, 267–83.

TOWNSEND, L. T. (1889), *The Bible and Other Ancient Literature in the Nineteenth Century* (New York).

TOYNBEE, A. J. (1954), *A Study of History*, viii (London).

VAN VALEN, L. (1974), 'A New Evolutionary Law', *Evolutionary Theory*, 1, 1–30.

VANDER WAERDT, P. A. (1987), 'The Justice of the Epicurean Wise Man', *Classical Quarterly*, NS 37, 402–22.

——(1988), 'Hermarchus and the Epicurean Genealogy of Morals', *Transactions of the American Philological Association*, 118, 87–106.

VIAN, F. (1952), *La Guerre des Géants: le mythe avant l'époque hellénistique* (Paris).

VIARRE, S. (1985), 'L'Androgynie dans les *Métamorphoses* d'Ovide', in J. M. Frécaut and D. Porte (eds.), *Journées ovidiennes de Parménie: actes du colloque sur Ovide* (24–26 juin 1983) (Brussels), 229–43.

VERNANT, J. P. (1965), *Mythe et pensée chez les Grecques* (Paris).

VLASTOS, G. (1946), 'On the Prehistory in Diodorus', *American Journal of Philology*, 67, 51–9.

VOLK, K. (2002), *The Poetics of Latin Didactic: Lucretius, Vergil, Ovid, Manilius* (Oxford).

WALLACE, A. R. (1903), *Man's Place in the Universe: A Study of the Results of Scientific Research in Relation to the Unity or Plurality of Worlds* (New York).

WASZINCK, J. H. (1964), 'La Création des animaux dans Lucrèce', *Revue belge de philologie et d'histoire*, 42, 49–56.

WATSON, P. (1984), 'Love as Civilizer: Ovid *Ars Amatoria* 2.467–92', *Latomus*, 43, 389–95.

WEST, D. (1964), 'Two Notes on Lucretius', *Classical Quarterly*, NS 14, 95–102.

——(1969), *The Imagery and Poetry of Lucretius* (Edinburgh).

West, D. (1975), 'Lucretius' Methods of Argument', *Classical Quarterly*, NS 25, 94–116.

West, M. L. (1966), *Hesiod* Theogony (Oxford).

West, M. L. (1978), *Hesiod* Works and Days (Oxford).

Whewell, W. (1837), *History of the Inductive Sciences* (London).

Whistler, C., and D. Bomford (1999), The Forest Fire *by Piero Di Cosimo* (Oxford).

White, K. D. (1967–8), 'Virgil's Knowledge of Arable Farming', *Proceedings of the Virgil Society*, 7,164–87.

—— (1970), *Roman Farming* (Ithaca, NY).

—— (1975), *Farm Equipment of the Roman World* (Cambridge).

Wilkins, J. (1997*a*), 'Evolution and Chance', online in the 'Talk Origins Archive', at http://www.talkorigins.org/faqs/chance/chance.html

—— (1997*b*), 'Darwin's Precursors and Influences', online in the 'Talk Origins Archive', at http://www.talkorigins.org/faqs/precursors/precur10.html

—— (2000), *The Boastful Chef: The Discourse of Food in Ancient Greek Comedy* (Oxford).

—— Harvey, D., and M. Dobson (eds.) (1995), *Food in Antiquity* (Exeter).

Wilkinson, L. P. (1969), *The* Georgics *of Virgil* (Cambridge).

Williams, G. W. (1968), *Tradition and Originality in Roman Poetry* (Oxford).Wills, J. (1996), *Repetition in Latin Poetry: Figures of Allusion* (Oxford).

Winterbottom, M. (2000), 'A Note on Lucretius 5.845–54', *Hermes*, 128, 505–6.

Wisniewski, B. (1983), 'Sur les origines de la théorie de la culture et du langage de Lucrèce', *Concilium Eirene*, 16, 177–82.

Wood, B., and M. Collard (1999), 'Is *Homo* Defined by Culture?', in Coles, Bewley, and Mellars, 1999, 11–23.

Wright, M. R. (1995), *Empedocles: The Extant Fragments* (London).

—— (1996), *Cosmology in Antiquity* (London).

—— (ed.) (2000), *Reason and Necessity: Essays on Plato's* Timaeus (London and Swansea).

Young, D. (1992), *The Discovery of Evolution* (Cambridge).

Young, R. M. (1971), 'Evolutionary Biology and Ideology: Then and Now', *Science Studies*, 1, 177–206 (rev. in W. Fuller (ed.), *The Biological Revolution* (New York, 1972), 241–82).

—— (1985), 'Darwinism is Social', in D. Kohn (ed.), *The Darwinian Heritage* (Princeton), 609–38.

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